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RESOURCES
ABSTRACTS



VOLUME 12, NUMBER 7
APRIL 1, 1979



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SELECTED WATER RESOURCES ABSTRACTS is produced by the Office of Water Research and Technology, U.S. Department of the Interior, and published twice monthly by the National Technical Information Service (NTIS), U.S. Department of Commerce, for the Water Resources Scientific Information Center (WRSIC).

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SELECTED WATER RESOURCES ABSTRACTS

Selected Water Resources Thesaurus includes abstracts, bibliographies, journals, books, reports, and more. The contents of the thesaurus include information on hydrology, soil science, environmental engineering, environmental management, environmental conservation, ecology, and more. Each abstract includes a full list of descriptors or identifiers.

A Semimonthly Publication of the Water Resources Scientific Information Center, Office of Water Research and Technology, U.S. Department of the Interior

Selected Water Resources Activities include research, development, management, and monitoring as one of the eight themes of the Water Resources Scientific Information Center (WRSIC). The Center was established in 1981 by Interior and has been designated by the Federal Science and Technology Council as the water resource authority by improving the communication of water research results. The Center is pursuing the above-mentioned activities and supplementing the existing scientific information activities associated with the science and investigation program in water resources.



VOLUME 12, NUMBER 7
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The Secretary of the U.S. Department of the Interior has determined that the publication of the periodical is necessary in the transaction of the public business required by law of this Department.

ment. Use of funds for printing this periodical has been approved by the Director of the Office of Management and Budget through August 31, 1983.

SELECTED WATER RESOURCES ABSTRACTS

As the Nation's principal conservation agency, the Department of the Interior has responsibility for most of our nationally owned public lands and natural resources. This includes fostering the wisest use of our land and water resources, protecting our fish and wildlife, preserving the environmental and cultural values of our national parks and historical places, and providing for the enjoyment of life through outdoor recreation. The Department assesses our energy and mineral resources and works to assure that their development is in the best interests of all our people. The Department also has a major responsibility for American Indian reservation communities and for people who live in Island Territories under U.S. administration.



VOLUME 37 NUMBER 1
APRIL 1, 1981

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SELECTED WATER RESOURCES ABSTRACTS

FOREWORD

1. WATER CYCLE

2a. General

Selected Water Resources Abstracts, a semimonthly journal, includes abstracts of current and earlier pertinent monographs, journal articles, reports, and other publication formats. The contents of these documents cover the water-related aspects of the life, physical, and social sciences as well as related engineering and legal aspects of the characteristics, conservation, control, use, or management of water. Each abstract includes a full bibliographical citation and a set of descriptors or identifiers which are listed in the **Water Resources Thesaurus**. Each abstract entry is classified into 10 fields and 60 groups similar to the water resources research categories established by the Committee on Water Resources Research of the Federal Council for Science and Technology.

WRSIC IS NOT PRESENTLY IN A POSITION TO PROVIDE COPIES OF DOCUMENTS ABSTRACTED IN THIS JOURNAL. Sufficient bibliographic information is given to enable readers to order the desired documents from local libraries or other sources.

Selected Water Resources Abstracts is designed to serve the scientific and technical information needs of scientists, engineers, and managers as one of several planned services of the Water Resources Scientific Information Center (WRSIC). The Center was established by the Secretary of the Interior and has been designated by the Federal Council for Science and Technology to serve the water resources community by improving the communication of water-related research results. The Center is pursuing this objective by co-ordinating and supplementing the existing scientific and technical information activities associated with active research and investigation program in water resources.

To provide WRSIC with input, selected organizations with active water resources research programs are supported as "centers of competence" responsible for selecting, abstract-

ing, and indexing from the current and earlier pertinent literature in specified subject areas.

Additional "centers of competence" have been established in cooperation with the Environmental Protection Agency. A directory of the Centers appears on the inside back cover.

Supplementary documentation is being secured from established discipline-oriented abstracting and indexing services. Currently an arrangement is in effect whereby the Bio-Science Information Service of Biological Abstracts supplies WRSIC with relevant references from the several subject areas of interest to our users. In addition to Biological Abstracts, references are acquired from Bioresearch Index which are without abstracts and therefore also appear abstractless in SWRA. Similar arrangements with other producers of abstracts are contemplated as planned augmentation of the information base.

The input from these Centers, and from the 51 Water Resources Research Institutes administered under the Water Resources Research Act of 1964, as well as input from the grantees and contractors of the Office of Water Research and Technology and other Federal water resource agencies with which the Center has agreements becomes the information base from which this journal is, and other information services will be, derived; these services include bibliographies, specialized indexes, literature searches, and state-of-the-art reviews.

Comments and suggestions concerning the contents and arrangements of this bulletin are welcome.

Water Resources Scientific Information Center
Office of Water Research and Technology
U.S. Department of the Interior
Washington, DC 20240

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SUBJECT FIELDS AND GROUPS

Please use the edge index on the back cover to locate Subject Fields and Indexes.

01 NATURE OF WATER

Includes the following Groups: Properties; Aqueous Solutions and Suspensions

02 WATER CYCLE

Includes the following Groups: General; Precipitation; Snow, Ice, and Frost; Evaporation and Transpiration; Streamflow and Runoff; Groundwater; Water in Soils; Lakes; Water in Plants; Erosion and Sedimentation; Chemical Processes; Estuaries.

03 WATER SUPPLY AUGMENTATION AND CONSERVATION

Includes the following Groups: Saline Water Conversion; Water Yield Improvement; Use of Water of Impaired Quality; Conservation in Domestic and Municipal Use; Conservation in Industry; Conservation in Agriculture.

04 WATER QUANTITY MANAGEMENT AND CONTROL

Includes the following Groups: Control of Water on the Surface; Groundwater Management; Effects on Water of Man's Nonwater Activities; Watershed Protection.

05 WATER QUALITY MANAGEMENT AND PROTECTION

Includes the following Groups: Identification of Pollutants; Sources of Pollution; Effects of Pollution; Waste Treatment Processes; Ultimate Disposal of Wastes; Water Treatment and Quality Alteration; Water Quality Control.

06 WATER RESOURCES PLANNING

Includes the following Groups: Techniques of Planning; Evaluation Process; Cost Allocation, Cost Sharing, Pricing/Repayment; Water Demand; Water Law and Institutions; Nonstructural Alternatives; Ecologic Impact of Water Development.

07 RESOURCES DATA

Includes the following Groups: Network Design; Data Acquisition; Evaluation, Processing and Publication.

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SELECTED WATER RESOURCES ABSTRACTS

2. WATER CYCLE

2A. General

A PARAMETRIC MODEL CALIBRATED WITH A PHYSICALLY BASED MODEL FOR RUNOFF PREDICTION FROM UNGAGED STREAMS

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

F. W. Bond.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 690, Price codes: A06 in paper copy, A01 in microfiche. MS Thesis, 1977, 94 p, 30 fig, 3 tab, 17 ref, 2 append. OWRT A-077-ARIZ(1). 14-34-0001-7006.

Descriptors: *Model studies, Forecasting, *Runoff forecasting, Streamflow, *Parametric models, Simulation analysis, Rainfall-runoff relationships, Rainfall intensity, *Watershed modeling.

Recent developments in the numerical solution of the governing partial differential equations for overland and channel flow (represented by sets of intersecting planes) should make possible models which predict runoff from ungaged streams. However, these models (physically based models) are complex and require much computer time. Parametric models exist which have the advantage of being relatively simple, and once calibrated may be used efficiently and inexpensively. This study developed a procedure for calibrating a parametric model against a physically based model utilizing base areas of one acre and one square mile, with the expectation that base areas can be combined to model real watersheds. Simulation experiments with the physically based model showed that, for the one-acre base area, the dominant parameters relate to the slope and friction of the planes, whereas for the square-mile area, the dominant parameters relate to the channel properties. The simple model-fitting parameters were the cell storage ratio, K, for the one-acre area, and K plus a lag factor, L, for the square-mile area. These parameters decreased more or less exponentially with increasing rainfall intensity and with changes in the physical parameters that produced high peaks and fast runoff.

W79-03003

ASPECTS OF PRESENT HYDROLOGICAL AND WATER QUALITY MODELLING, Karlsruhe Univ. (Germany, F.R.) Inst. fuer Siedlungswasserwirtschaft.

For primary bibliographic entry see Field 6A.

W79-03082

A NEW APPROACH TO URBAN WATER RESOURCES SYSTEMS OPTIMIZATION, Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.

For primary bibliographic entry see Field 6A.

W79-03124

URBAN RUNOFF CONTROL PLANNING, American Society of Civil Engineers, NY. Urban Water Resources Research Council.

For primary bibliographic entry see Field 6B.

W79-03273

THE GENERAL LINEAR MODEL WITH PRIOR INFORMATION, Ireland Office of Public Works, Dublin.

For primary bibliographic entry see Field 2E.

W79-03280

EFFECTS OF SIZE AND SHAPE OF A REGION ON DROUGHT COVERAGE, Colorado State Univ., Fort Collins. Dept. of Civil Engineering; and Colorado State Univ., Fort Collins. Hydrology and Water Resources Program.

For primary bibliographic entry see Field 2B.

W79-03296

A PRECARIOUS BALANCE UPSET, V. A. Kovda.

UNESCO Courier, July 1977, p 10-14, 3 fig.

Descriptors: *Desertification, *Comprehensive planning, *Water balance, *Forecasting, Fallowing, Surface runoff, Erosion, Water management(Applied), Water levels, Climatology, Cycles.

In this review of desertification (which this author refers to as aridification), we are shown how the phenomenon traditionally begins as a result of deforestation, increasing surface runoff, a lowering of groundwater tables, and deterioration of grasslands while temperatures and rainfall remain normal. Arid lands can be used productively with cautious and sensible irrigation and grazing management, although today, as in the past, the natural tendency toward desertification and cyclical climatic changes has been greatly aggravated by human error. Characterized by a lack of water, all the arid, semiarid, and dry steppelands of the world are fragile and unstable. Despite the need to maintain an ecological balance in these areas, primitive methods of farming based upon one-crop systems, excessive grazing, and nomadic livestock production beyond the carrying capacity of pastures have been the rule rather than the exception. Unfavorable climatic fluctuations, coupled with the slow pace at which modern knowledge and improved management techniques are disseminated and accepted, have caused specialists to forecast that the trend toward desertification may be expected to continue. (Tickes-Arizona)

W79-03432

2B. Precipitation

DIURNAL VARIATION IN RAINFALL AND CLOUDINESS, Hawaii Univ., Honolulu. Water Resources Research Center.

T. A. Schroeder, B. J. Kilonsky, and B. N. Meissner.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 704, Price codes: A04 in paper copy, A01 in microfiche. Technical Report No 112, July 1977, 67 p, 56 fig, 8 tab, 43 ref. OWRT A-072-HI(1). 14-34-0001-7026.

Descriptors: *Meteorological satellites, *Orographic precipitation, *Rainfall, *Hawaii, Precipitation, Sea breezes, Climatology, Meteorology, *Clouds, Maps, *Rainfall-temporal distribution, *Trade winds.

Maps of diurnal rainfall patterns based on hourly rainfall records are presented for the six major Hawaiian islands. The resulting rainfall distributions demonstrate the complexity of the interaction between trade winds and large islands. Distributions for windward stations on the low islands have early morning maxima common to the tradewind rainfall over open oceans. Mesoscale circulations and moisture extraction by windward mountain barriers modify the oceanic pattern, particularly on the high islands. Patterns on Hawai'i shift from nocturnal maxima on windward coasts to pronounced day time maxima on the leeward coasts. At higher windward elevations on Mauna Loa and Mauna Ke'a, the pattern shows afternoon peaks as contrasted to nocturnal maxima at windward coasts, such as at Hilo. First harmonic R2 approached .90 at windward stations on small islands and in regions of strong mesoscale circulations. For the largest island, Hawai'i, R2 exceeded .60 for all stations examined. Hourly mean cloudiness maps for a two-week period in July 1976 are presented for Hawai'i Island based on SMS-2 geostationary satellite images. Tests verify the subjective analysis procedure, particularly when applied to the visible images. Although rainfall over most of the island was below normal, rainfall frequencies were not, indicating that observed cloudiness was typical of summer conditions. Stations were geographically grouped. Windward coastal stations have small diurnal cloudiness variations but pronounced nocturnal rainfall maxima. Higher elevation windward stations have larger cloudiness

variation but smaller rainfall variation, while leeward stations have large and pronounced variations in both rainfall frequency and cloudiness, with maxima occurring in the late afternoon.

W79-03033

CHEMICAL COMPOSITION OF ACID PRECIPITATION IN PASADENA, CALIF.

California Inst. of Tech., Pasadena. Dept. of Environmental Engineering Science.

For primary bibliographic entry see Field 5A. W79-03054

HYDROLOGY OF SMALL OCEANIC ISLANDS

- INFLUENCE OF ATMOSPHERIC PRESSURE ON THE WATER TABLE,

Washington State Univ., Pullman. Dept. of Geology.

For primary bibliographic entry see Field 2L. W79-03056

HISTORICAL CLIMATOLOGY,

University of East Anglia, Norwich (England). Climatic Research Unit.

M. J. Ingram, D. J. Underhill, and T. M. L. Wigley.

Nature, Vol 276, No 5686, (Climatology Supplement), p 329-334, November 23, 1978. 8 fig, 2 tab, 35 ref.

Descriptors: *Climatology, *History, *Analytical techniques, Data processing, Methodology, Weather data, Climates, Climatic data, Temperature, Precipitation(Atmospheric), Documentation, Information retrieval, Meteorology, Weather, *Historical climatology.

Descriptive documentary evidence is an important source of detailed information on past climates, particularly for the period between the 11th century and the beginning of the era of instrumental meteorology. Historical climatology is concerned with the study and climatic interpretation of this evidence. However, there are many pitfalls in using historical records, associated with the fact that such records were rarely written primarily as descriptions of climate and with the fact that many readily accessible records are of doubtful reliability. A critical look at existing work in the field was taken, with the aim of isolating many problems which need to be recognized and overcome before historical climatology can be considered to rest on a secure methodological and factual footing. (Sims-ISWS)

W79-03068

TREE-RING EVIDENCE OF PAST CLIMATIC VARIABILITY,

Arizona Univ., Tucson. Lab. of Tree-Ring Research.

V. C. LaMarche, Jr.

Nature, Vol 276, No 5686, (Climatology Supplement), p 334-338, November 23, 1978. 6 fig, 40 ref.

Descriptors: *Dendrochronology, *Paleoclimatology, *Climatology, Precipitation(Atmospheric), Rainfall, Temperature, Weather, Trees, Data collections, Data processing, Analytical techniques, Fluctuations, Variability, Climates, Meteorology, Dendroclimatology.

The increasingly visible impact of climatic variability on human affairs lends a sense of urgency to the task of better understanding the workings of the Earth's climatic system. Actual instrumental observations of climate are relatively short, and therefore, it is necessary to turn to other sources for information about past climates to help develop and test the models that may allow the prediction of climatic anomalies such as prolonged droughts or a series of severe winters. Tree-rings are one of the best sources of climatic proxy information. Tree-rings can provide long, accurately dated, year-by-year records at many points around the globe, and they can bridge the gap between recent instrumental or historical data and the longer but more generalized geological records. Variations in the width of annual rings reflect the influence of

Field 2—WATER CYCLE

Group 2B—Precipitation

climatic factors that limit the biological processes governing ring formation within a tree. Study of reconstructions of long records of a variety of climatic and related variables, such as temperature, precipitation, stream runoff, and barometric pressure over periods of several hundred to several thousand years strongly suggests that the climate of the past century or so is not representative of the conditions that frequently have prevailed over long periods. Proxy records are a great help in efforts to anticipate or predict future climate, which may be significantly different from the recent climatic past. (Sims-ISWS)
W79-03069

MECHANISMS AND MODELS OF CLIMATIC CHANGE

Imperial Coll. of Science and Technology, London (England). Dept. of Physics.
G. J. Shutte, and J. S. A. Green.
Nature, Vol 276, No 5686, (Climatology Supplement), p 339-342, November 23, 1978. 4 fig, 15 ref.

Descriptors: *Climatology, *Model studies, *Mathematical models, Methodology, Analytical techniques, Climates, Variability, Solar radiation, Temperature, Dusts, Carbon dioxide, Heat transfer, Oceans, Albedo, Meteorology, *Climatic change.

Many theories about climate change are essentially untenable, but it is still possible to develop a consistent model based on understandable physics—in fact the data cannot be interpreted without one. It is believed that there is some fundamental defect in all present models; it could be something physically improbable, like an unreasonable effect of tiny solar variations. More likely there is a fundamental lack in an appreciation of how very interactive systems behave. (Sims-ISWS)
W79-03070

NUMERICAL SIMULATION OF CLIMATE AND CLIMATIC CHANGE

British Meteorological Office, Bracknell (England).

A. Gilchrist.

Nature, Vol 276, No 5686, (Climatology Supplement), p 342-345, November 23, 1978. 20 ref.

Descriptors: *Climatology, *Model studies, *Mathematical models, Equations, Circulation, Air circulation, Albedo, Carbon dioxide, Air pollution effects, Forecasting, Climates, Weather, Temperature, Air temperature, Meteorology, *Climatic change.

Detailed three-dimensional numerical models of the atmosphere, coupled as necessary to models of other parts of the climatic system, provide the most promising approach to understanding the physical basis of climate. Models of this kind can be used to investigate the impact of anthropogenic pollution on climate. At the present time, the main concern is with increasing concentrations of CO₂ which might lead to overall warming of the troposphere, but chemical and thermal pollution also may pose a threat. The possible climatic changes would take place slowly and would involve the response of the slowly reacting parts of the climatic system, particularly the oceans. The problem of how to simulate such changes of climate presents many difficulties which are being studied. (Sims-ISWS)
W79-03071

RECENT DEVELOPMENTS IN ATMOSPHERIC CHEMISTRY

Cambridge Univ. (England). Dept. of Physical Chemistry.

For primary bibliographic entry see Field 2K.

W79-03072

SOLAR-TERRESTRIAL INFLUENCES ON WEATHER AND CLIMATE

California Univ., Los Angeles. Dept. of Atmospheric Sciences.

G. L. Siscoe.

Nature, Vol 276, No 5686, p 348-352, November 23, 1978. 2 fig, 59 ref.

Descriptors: *Solar radiation, *Weather, *Climatology, Variability, Temperature, Precipitation(Atmospheric), Ozone, Ultraviolet radiation, Correlation analysis, Regression analysis, Cycles, Droughts, Meteorology, Solar variability, Sun-weather relationships, Climatic change, Sunspots, Magnetic effects.

During the past century over 1,000 articles have been published claiming or refuting a correlation between some aspect of solar activity and some feature of terrestrial weather or climate. Nevertheless, the sense of progress that should attend such an outpouring of 'results' has been absent for most of this period. The problem all along has been to separate a suspected sun-weather signal from the characteristically noisy background of both systems. The present decade may be witnessing the first evidence of progress in this field. Three independent investigations have revealed what seem to be well resolved sun-weather signals, although it is still too early to have unreserved confidence in all cases. The three correlations are between terrestrial climate and Maunder Minimum-type solar activity variations, a regional drought cycle and the 22-yr solar magnetic cycle, and winter hemisphere atmospheric circulation and passages by the Earth of solar sector boundaries in the solar wind. The apparent emergence of clear sun-weather signals stimulated numerous searches for underlying physical causal links. (Sims-ISWS)
W79-03073

PREDICTABILITY OF CLIMATE

National Center for Atmospheric Research, Boulder, CO.

C. E. Leith.

Nature, Vol 276, No 5686, (Climatology Supplement), p 352-355, November 23, 1978. 2 fig, 10 ref.

Descriptors: *Climatology, *Mathematical models, *Numerical analysis, Forecasting, Weather, Climates, Statistics, Statistical method, Statistical models, Fluctuations, Data processing.

A mathematical framework was presented for the study of the predictability of small changes in the climatic system. From a statistical definition of climate in terms of ensemble averages, a limit to predictability was found which arises from random weather fluctuations. This limit typically referred to as climate noise, is often able to obscure a possible climate signal produced by external forcing. A separation of timescales of climatic response also was presented as a convenient means to distinguish between the fast internal (for example, the atmosphere) and the slow external (for example, the oceans) systems. In this way, it is possible to estimate the climate signal in the internal system that arises from small changes in the slow external system. Finally, a theoretical approach was presented for the inclusion of possible feedback effects in the estimation of a climate signal. Such feedback effects could result from the external climatic system being influenced by a change in the mean properties of the fast internal climatic system. (Sims-ISWS)
W79-03074

PREDICTING TEMPERATURE TREND IN THE NORTHERN HEMISPHERE TO THE YEAR 2000

British Meteorological Office, Bracknell (England).

M. K. Miles.

Nature, Vol 276, No 5686, (Climatology Supplement), p 356-359, November 23, 1978. 4 fig, 10 ref.

Descriptors: *Climatology, *Temperature, *Air pollution, *Solar radiation, Carbon dioxide, Variability, Fluctuations, Air temperature, Weather, Cycles, Forecasting.

The cooling of the Northern Hemisphere since 1940 has been interpreted variously as the overture to the next Ice Age, the effect of industrial pollution in the atmosphere, or of a decline in the solar

output. Are we in a position to judge among these various interpretations and to make a prediction for the next few decades. The link with the next Ice Age may be dismissed as a confusion of timescales; the explanation in terms of atmospheric pollution merits careful examination but seems unlikely to be adequate on its own. Natural fluctuations also must be considered. (Sims-ISWS)
W79-03075

DERIVATION OF EQUATIONS FOR VARIABLE RAINFALL INFILTRATION

Colorado State Univ., Fort Collins. Engineering Research Center.

For primary bibliographic entry see Field 2G.

W79-03095

STOCHASTIC MODELS FOR MONTHLY RAINFALL FORECASTING AND SYNTHETIC GENERATION

Purdue Univ., Lafayette, IN. School of Civil Engineering.

J. W. Delleur, and L. M. Kavvas.
Journal of Applied Meteorology, Vol 17, No. 10, October 1978. p. 1528-1536, 3 fig, 4 tab, 9 ref.

OWRT B-036-IND(18)

Descriptors: *Stochastic processes, *Rainfall, *Forecasting, Time series analysis, Precipitation(Atmospheric), Synthetic hydrology, Monthly, *Model studies, Indiana, Illinois, Kentucky, *Rainfall forecasting, *Ohio River Basin.

The Integrated Autoregressive Moving Average (ARIMA) model was applied to the average monthly rainfall time series over 15 basins located in Indiana, Illinois and Kentucky, with areas varying between 240 and 4000 mi approximately. The record length varied from 492 to 618 months. The first-order, mixed, autoregressive, moving average model emerged as the most suitable one for forecasting and generation of cyclically standardized monthly rainfall square roots series. The model passed the goodness-of-fit test in all cases studied. The seasonally differenced, multiplicative model applied to monthly rainfall square roots also passed the goodness-of-fit test in all cases. This model has the advantage of requiring fewer parameters than the previous one. However, the use of the differenced models is limited to forecasting of monthly rainfall series and cannot be used for the generation of synthetic rainfall time series, as it does not preserve the monthly standard deviations. Seasonal differencing is effective in removing the periodicities but distorts the spectral structure of the original rainfall series, whereas cyclic standardization only introduces a negligible distortion in the random component while effectively removing the circularly stationary part.

W79-03112

A METEOROLOGICAL APPROACH TO THE IDENTIFICATION OF DROUGHT SENSITIVE PERIODS IN FIELD CROPS

Orange Free State Univ., Bloemfontein (South Africa).

L. P. de Bruyn, and J. M. de Jager.

Agricultural Meteorology, Vol. 19, No. 1, January 1978, p. 35-40, 3 fig, 8 ref.

Descriptors: *Crop response, *Drought resistance, *Micrometeorology, Planting management, *Moisture stress, Water utilization, *South Africa, Drought tolerance, Soil moisture, Statistical models, Analytical techniques.

A procedure for the determination of drought sensitive periods in field crops is illustrated. Drought sensitivity is derived by means of a statistical model from the correlation of the number of stress days occurring during short periods with growth and yield. Thirty-three different sets of water supply conditions were obtained for the analysis by following different cultivation practices over ten summer seasons. A local long seasoned (145 days) dryland maize was used as the test crop in this attempt to show how a mathematical model using rainfall and evaporation data can be used to assess the degree of sensitivity of yield to drought occur-

WATER CYCLE—Field 2

Snow, Ice, and Frost—Group 2C

ring in short-term periods during the growing season. Customarily drought stress investigations have concentrated on plant and/or soil moisture data. For the present study, however, sensitivity is derived by the magnitude of significant correlation between stress days and growth and yield. Results indicate that number of stress days is a reliable and accurate indication of drought sensitivity. (Tickeys-Arizona)
W79-03130

ANTHROPOGENIC IMPACT ON THE ALBEDO OF THE EARTH,

Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.

J. Otterman.

Climatic Change, Vol. 1, No. 2, p 137-155, 1977. 3 tab, 5 fig, 51 ref.

Descriptors: *Albedo, *Solar radiation, *Grazing, *Remote sensing, *Monitoring, Soil surfaces, Vegetation effects, Irrigation effects, Atmospheric physics.

Activity by man and animal is analyzed here as it affects the surface albedo of the earth. Defined as the effective reflectivity integrated over the hemisphere of all possible reflection directions and over all the wavelengths of the solar irradiation, surface albedo is variable over different types of terrain. The climatic significance of this study lies in the fact that the albedo of the earth-atmosphere system determines directly how much of the solar irradiation is reflected into space and how much is absorbed by our climatic system. Albedo measurements are complex and can be made either in the laboratory or from the ground, aircraft, or satellite. The anthropogenic impact of overgrazing on change is emphasized here. The unexpected finding from Landsat imagery over Israel is that overgrazing in arid and semiarid regions has a sharp impact of increasing the albedo, where moisture-limited vegetation covers only a fraction of the terrain even when hindered by man or animal. Additionally, the albedo of clear water bodies is quite low, thus creation of artificial water bodies can result in a sharp decrease of the albedo. Irrigation also results in a very pronounced lowering of the albedo of the soil. Examples from Lake Nasser, the Persian Gulf area, and the Negev-Sinai areas illustrate these observations. But the impact of anthropogenic activities, with the emphasis on overgrazing, prompts this author to recommend continued monitoring, particularly on a seasonal basis in cultivated areas, to determine the effect of albedo on desertification. (Tickeys-Arizona)
W79-03134

INTERACTION BETWEEN THE WEST ARABIAN SEA AND THE INDIAN MONSOON,

Institute of Tropical Meteorology, Poona (India).

K. Raghavan, P. V. Puranik, V. R. Mujumdar, P. M. M. Ismail, and D. K. Paul.

Monthly Weather Review, Vol. 106, No. 5, p. 719-

724, May 1978. 14 fig, 1 tab, 4 ref.

Descriptors: *Monsoons, *Water temperature, *Sea water, *India, Air circulation, Winds, Vapor pressure, Atmospheric pressure, Meteorology, Synoptic analysis.

It has been speculated that cold sea surface temperature over the West Arabian Sea leads to a drastic reduction of monsoon rainfall over India and the adjoining region because the cold sea decreases the evaporation rate and increases the surface pressure leading to a reduction in the cross-equatorial flow and moisture flux downstream. The purpose of the present analysis was to test this hypothesis through a short observational study based on the best set of records available for the region. In mid-July 1964, during the International Indian Ocean Expedition, there was drastic reduction of rainfall in the central parts of India. Surface pressure and temperature, as well as cross-equatorial flow and rainfall were measured in the area. The temperature of the West Arabian Sea was measured and found to be cold over a larger area compared to a wet spell in the same month. Until a high pressure belt approached from India

during the drought, there was no organized high pressure zone in the sea as would be expected as a result of the low temperature there. The strengthening and weakening of the Indian monsoon was found, however, to be associated with pressure changes on a synoptic scale, and these pressure changes over India appear to have a controlling influence on the strength of the cross equatorial flow in the West Arabian Sea. (Tickeys-Arizona)
W79-03135

A REANALYSIS OF THE SKAGIT CLOUD SEEDING PROJECT,

Washington Univ., Seattle. Dept. of Atmospheric Sciences.

For primary bibliographic entry see Field 3B.

W79-03275

EFFECTS OF SIZE AND SHAPE OF A REGION ON DROUGHT COVERAGE,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering; and Colorado State Univ., Fort Collins. Hydrology and Water Resources Program. N. Tase, and V. Yevjevich.

Hydrological Sciences Bulletin, Vol. 23, No. 2, p 203-212, June 1978. 6 fig, 1 tab, 6 ref. NSF ENG 74-17396.

Descriptors: *Droughts, *Regional analysis, *United States, *Great Plains, Size, Shape, Stochastic processes, Gages, Time, Precipitation(Atmospheric), Gaging, Probability, *Drought coverage, *Drought probabilities, Monthly precipitation series, Time-area models, Historical droughts, Grid points.

The stochastic components of monthly precipitation series at gaging stations over the Great Plains of the United States were used to derive time-area models from which new series were generated at a square grid of points. They served as information for the analysis of area drought coverage by considering the effects of size and shape of a region. Drought probabilities over a region were more affected by size of the region than by its shape, with the shape affecting drought probabilities in the case of small regions. Droughts were studied best by investigating simultaneously their severity (individual time-unit water shortage), total water deficit over time or area, or both time duration and areal coverage. (Roberts-ISWS)
W79-03296

RAINFALL DISTRIBUTION OVER INDIAN SUB-DIVISIONS DURING THE WETTEST AND THE DRIEST MONSOONS OF THE PERIOD 1901-1960,

Institute of Tropical Meteorology, Poona (India).

O. N. Dhar, A. K. Kulkarni, and G. C. Ghose.

Hydrological Sciences Bulletin, Vol. 23, No. 2, p 213-221, June 1978. 3 fig, 5 tab, 3 ref.

Descriptors: *Monsoons, *Rainfall, *Distribution patterns, *Excessive precipitation, *Droughts, Precipitation(Atmospheric), Variability, Seasonal, Precipitation intensity, Spatial distribution, Data processing, Climatology, *India.

An attempt was made to study the rainfall for the subdivisions of India for the wettest and the driest monsoons (i.e., June-September) during the period 1901-1960. All the rainfall stations in each subdivision were taken into consideration to work out the average rainfall of each subdivision for individual months, seasons, and years. The subdivisions of the country that existed on 1 January 1971 were considered. This study showed that during the 60-year period, 1917 was the wettest year and 1918 the driest year. The rainfall distribution in the monsoon periods (i.e., June to September) of the wettest and driest years, 1917 and 1918, respectively, was studied. Possible meteorological causes for the exceptional rainfall in 1917 and the drought in 1918 also were mentioned briefly. (Sims-ISWS)
W79-03297

ARE DESERTS MAN-MADE,

Cairo Univ., Giza (Egypt).

M. El-Kassas.

UNESCO Courier, July 1977, p 4-6, 2 fig.

Descriptors: *Deserts, *Desertification, *Fluctuations, *Rainfall, *Cycles, Arid lands, Erosion, Equilibrium, Land use, Carrying capacity, Seasonal, Variability, Economic aspects, Political aspects.

This author characterizes the world's deserts, which cover approximately one-third of the Earth's land surface, into runoff deserts, rainfall deserts, and rainless deserts. Such categorization, he admits, is arbitrary, but certainly rainfall, or the lack of it, is one of the crucial climatic elements shared by all arid and semiarid regions. Principle considerations are the seasonal, variable, short-term, deficiency characteristics of rainfall, all of which play a role in the phenomenon of desertification, defined for the purpose of this analysis as retrogressive ecological changes in vegetation, soil, and water regimes that reduce productivity, lower carrying capacity, or make the land more vulnerable to erosion. Organisms, man, plant, animal, are all in a precarious and dynamic equilibrium in these arid areas with scarce natural resources. Failure to keep within the bounds of this equilibrium can create irreversible desertification. Traditionally, land usage in these regions has followed a cyclic pattern, including shifting cultivation followed by colonization and orchard periods, with the end result always being deterioration of the land. An analysis of these cyclic patterns supports this author's conclusion that desertification is but the end result of ecological, economic, and political pressures. (Tickeys-Arizona)
W79-03436

2C. Snow, Ice, and Frost

WASTEWATER TREATMENT IN COLD CLIMATES,

Army Terrestrial Sciences Center, Hanover, NH. For primary bibliographic entry see Field 5D.

W79-03020

SEDIMENTOLOGY OF MEDIAL MORAINES ON BERENDON GLACIER, BRITISH COLUMBIA, CANADA: IMPLICATIONS FOR DEBRIS TRANSPORT IN A GLACIALIZED BASIN,

University of East Anglia, Norwich (England).

School of Environmental Sciences.

N. Eyles, and R. J. Rogerson.

Geological Society of America Bulletin, Vol. 89, No. 11, p 1688-1693, November 1978. 9 fig, 48 ref.

Descriptors: *Glaciers, *Canada, *Sediments, *Glacial sediments, On-site investigations, Laboratory tests, Glacial drift, Particle size, Rocks, Bedrock, Glaciology, Sedimentology, *Berendon Glacier(Canada).

The character of sediments from medial moraines on Berendon Glacier, British Columbia, reflects periglacial processes rather than direct glacial erosion and transport. Sediments are passively transported as talus by the glacier, and a distinct sedimentology can be contrasted with lodgement tills. Medial moraine sediment is derived from a number of sources and is transported on the glacier surface and at depth near the glacier bed—there is no evidence of either textural evolution with increasing distances of glacial transport or enhanced scour of the glacier bed in the vicinity of medial moraines. Particle-size distribution of both medial moraine debris (supraglacial morainic till) and lodgement tills was found to be independent of source rock. A bimodal grain-size distribution widely reported from the analysis of far-traveled Pleistocene tills from the mid-latitudes, reflecting the crushing characteristics of component minerals in the source rock, is not exhibited by tills from Berendon Glacier, which have well-defined lithological sources. This reflects the short distances of debris transport by the glacier and is considered to be typical of other temporal valley glaciers. (Sims-ISWS)
W79-03052

Field 2—WATER CYCLE

Group 2C—Snow, Ice, and Frost

LOESS DEPOSITS ASSOCIATED WITH DESERTS,
Leeds Univ. (England). Dept. of Civil Engineering.
For primary bibliographic entry see Field 2J.
W79-03138

CALCULATED SNOWPACK EVAPORATION DURING CHINOOKS ALONG THE EASTERN SLOPES OF THE ROCKY MOUNTAINS IN ALBERTA,
Northern Forest Research Center, Edmonton (Alberta).
For primary bibliographic entry see Field 2D.
W79-03274

WILL DESERTS DRINK ICEBERGS,
P. E. Victor.
UNESCO Courier, February 1978, p 17-22. 5 fig.

Descriptors: *Icebergs, *Sea ice, *Melt water, *Future planning(Projected), *Imported water, *Water transfer, Water sources, Planning, Freshwater, Economic feasibility, Project feasibility.

As world demands for fresh water increase, only two methods stand out as viable alternatives for increasing the present supply of freshwater: desalination of sea water and use of polar ice. Although icebergs contain the purest water on earth, it is estimated that the Antarctic icecap loses more than 10,000 billion cubic meters of ice per year in the form of icebergs which eventually melt and disappear. Much of this loss and perhaps more is regained through accumulated snowfall. It is estimated that an average-sized iceberg would provide 80 billion liters of freshwater, even after a 20 percent loss during transportation. Because icebergs from the north pole are of irregular unstable shape and smaller size, it is likely that the larger and more regular shaped icebergs from Antarctica will be the source of the first transported ice. Economically it is estimated that such a project would cost 60 cents per cubic foot of water as compared to the present 80 cents for the same quantity delivered through desalination. The technical feasibility of iceberg transportation is presently under study by an international scientific commission of ten scientists appointed following an international conference in Iowa in 1977. Research into the questions of iceberg drift, structure, internal stress, erosion, and other practical and theoretical problems is underway, and although many answers are needed, icebergs are a promising and exciting source of future freshwater. (Ticke-Arizona)
W79-03437

FROZEN GROUND PROBABILITIES USING DISCRIMINANT ANALYSIS,
Taiwan Provincial Pingtung Inst. of Agriculture, Dept. of Forestry.
E. S. Yen, M. Molnau, and D. K. McCool.
Paper presented at the 1976 Annual Meeting, American Society of Agricultural Engineers University of Nebraska, Lincoln, June 27-30, 1976. Pa=per No. 76-2085. ASAE St. Joseph, Michigan, 17 p, 7 fig, 2 tab, 13 ref. OWRT A-045-IDA(2), 14-34-0001-6013.

Descriptors: Floods, Rain, *Flood forecasting, *Frozen ground, *Frozen soils, Runoff, Temperature, Classification, Soil temperature, Erosion, Flood damage, *Idaho, Washington, *Discriminant analysis, Freeze-thaw cycles, Palouse Area.

Floods occurring on frozen ground are destructive, both from the point of view of flood severity and erosion hazard. Discriminant analysis was used to classify past runoff events as occurring on frozen or unfrozen ground. For the Greater Palouse area, the average minimum temperature during the freeze period was the single most important variable in classification of events. The method did not appear to work well for a large basin in southern Idaho.
W79-03440

2D. Evaporation and Transpiration

A FIELD STUDY OF THE EFFECT OF WATER DEFICIT ON WATER USE EFFICIENCY,
Kansas Water Resources Research Inst., Manhattan.

For primary bibliographic entry see Field 2I.
W79-03036

CALCULATED SNOWPACK EVAPORATION DURING CHINOOKS ALONG THE EASTERN SLOPES OF THE ROCKY MOUNTAINS IN ALBERTA,
Northern Forest Research Center, Edmonton (Alberta).

D. L. Golding.
Journal of Applied Meteorology, Vol. 17, No. 11, p 1647-1651, November 1978. 1 fig, 1 tab, 11 ref.

Descriptors: *Snow cover, *Evapotranspiration, *Chinook, *Rocky Mountain Region, Moisture uptake, Trees, Ablation, Watershed management, Elevation, Sublimation, *Snowpack elevation, *Alberta Rocky Mountains, *Colorado Rockies, *Central Sierra Snow Laboratory, *Piegon Mountain, Picnic atmometer, Tree line, Potential evaporation.

Evaporation from the snowpack during chinooks results in significant moisture loss along the eastern slopes of the Rocky Mountains in Alberta, Canada. From January through March 1976, calculated potential evaporation was as high as 88 mm depth of water above the tree line and 53 mm below tree line. Potential evaporation averaged 1.2 mm/day in 1975, and 2.0 mm/day in 1976. Snowpack evaporation was no greater at the two major gaps in the study area than where no gaps existed. Evaporation was greater above tree line than below tree line, but it was not a function of elevation. For the same 3-month period, there were 24 chinook days in 1975 and 22 in 1976. (Roberts-ISWS)
W79-03274

A HIGH-ACCURACY RECORDING PAN-EVAPORIMETER AND SOME OF ITS POSSIBILITIES,

Institute for Land and Water Management Research, Wageningen (The Netherlands).

G. W. Bloemen.
Journal of Hydrology, Vol. 39, No. 1/2, p 159-173, October 1978. 11 fig, 1 tab, 10 ref.

Descriptors: *Evaporimeters, *Instrumentation, *Evaporation pans, Rainfall, Gravitational water, Plastics, Gaging, Free surfaces, Water loss, Evapotranspiration, *Recording pan-evaporimeter, Plastic dome, Free water surface, Open water evaporation, Shielding, Evaporographs.

An instrument was described which was built to record simultaneously pan evaporation and rainfall with a high degree of accuracy. It is in use for routine measurements, but also can be applied to the investigation of some aspects of pan evaporation. In this context, the influence of the depth of the evaporation pan was demonstrated. It was shown that an open pan is unsuitable for gaging evaporation or rainfall on rainy days. An explanation was given of the need of shielding the pan from rainfall with a plastic dome during routine measurements of open-water evaporation. (Roberts-ISWS)
W79-03281

A SOIL MOISTURE BUDGET MODEL ACCOUNTING FOR SHALLOW WATER TABLE INFLUENCES,

Purdue Univ., Lafayette, IN. Dept. of Agronomy. For primary bibliographic entry see Field 2G.
W79-03481

2E. Streamflow and Runoff

A PARAMETRIC MODEL CALIBRATED WITH A PHYSICALLY BASED MODEL FOR

RUNOFF PREDICTION FROM UNGAGED STREAMS,

Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.
For primary bibliographic entry see Field 2A.
W79-03003

THE GENERAL LINEAR MODEL WITH PRIOR INFORMATION,

Ireland Office of Public Works, Dublin.

T. Bree.
Journal of Hydrology, Vol. 39, No. 1/2, p 113-127, October 1978. 3 fig, 1 tab, 15 ref.

Descriptors: *Unit hydrographs, *Model studies, *Systems analysis, Hydrologic systems, Statistics, Statistical models, Stability, Hydrology, Least squares method, Equations, General linear model, Filtered least squares, Constrained least squares, Linear-equality constraints, Linear-inequality constraints.

Prior information was used to tackle the stability problems encountered in estimating the parameters of the general linear model. Constraints were incorporated into the estimation of a unit hydrograph where the observed sample inputs are highly collinear. The effects of the constrained estimation on the stability of the system and on the statistical properties of the estimator were examined. Constraints for volume, smoothness, nonnegativity, and a monotonic recession were included. These were applied separately and in different combinations, and the results were described. (Lee-ISWS)
W79-03280

FLOOD FREQUENCY ANALYSIS BY POWER TRANSFORMATION,

Indian Inst. of Tech., New Delhi. Dept. of Civil Engineering.

S. Chander, S. K. Spolia, and A. Kumar.
Journal of Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14179, p. 1495-1504, November 1978. 4 fig, 5 tab, 11 ref.

Descriptors: *Flood frequency, *Flood plains, *Food routing, Floods, *Frequency analysis, Hydrology, Statistical methods, Equations, Foreign countries, Foreign research, *Statistical analysis, Kurtosis, Transformation.

Flood peaks were estimated using the power transformation method. This method was preferred as it does not require a prior knowledge of the frequency distribution of the population. Annual flood peaks for 15 rivers were analyzed, and it was shown that power transformation is more effective than SMEMAX and log transformations in normalizing the skewed flood distribution. The effect of kurtosis also was taken into account in the estimation of flood peaks. Flood peaks of 100-yr and 200-yr recurrence intervals were computed using power transformation method, and the results were compared with several existing methods. Frequency curves of actual data were plotted, and it was shown that, at higher probability of non-exceedance, curves based on power transformation fit closest to the observed data. (Lee-ISWS)
W79-03287

NEW NONLINEAR SHALLOW-FLOW EQUATIONS WITH CURVATURE,

National Aeronautics and Space Administration, Washington, DC.

For primary bibliographic entry see Field 8B.
W79-03293

EVALUATION OF THERMOGRAPH DATA FOR CALIFORNIA STREAMS,

Geological Survey, Menlo Park, CA. Water Resources Div.

J. T. Limerinos.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 500, Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-66, October 1978. 38 p, 3 fig, 6 tab, 29 ref.

WATER CYCLE—Field 2

Groundwater—Group 2F

Descriptors: *Water temperature, *Streams, *California, Data collections, Monitoring, Measurement, Evaluation, Statistical methods, Thermographs, Harmonic analysis.

Statistical analysis of water-temperature data from California streams indicates that, for most purposes, long-term operation of thermographs (automatic water-temperature recording instruments) does not provide a more useful record than either short-term operation of such instruments or periodic measurements. Harmonic analyses were made of thermograph records 5 to 14 years in length from 82 stations. More than 80 percent of the annual variation in water temperature is explained by the harmonic function for 77 of the 82 stations. Harmonic coefficients based on 8 years of thermograph record at 12 stations varied only slightly from coefficients computed using two equally split 4-year records. At five stations where both thermograph and periodic (10 to 23 measurements per year) data were collected concurrently, harmonic coefficients for periodic data were defined nearly as well as those for thermograph data. Results of this analysis indicate that, except where detailed surveillance of water temperatures is required or where there is a chance of temporal change, thermograph operations can be reduced substantially without affecting the usefulness of temperature records. (Woodard-USGS)

W79-03336

ANALYSIS OF RUNOFF FROM SMALL DRAINAGE BASINS IN WYOMING,

Geological Survey, Cheyenne, WY. Water Resources Div.

G. S. Craig, Jr., and J. G. Rankl.

Available from Supt. of Documents, GPO, Washington, DC 20402, Price, \$2.20. Water-Supply Paper 2056, 1978. 70 p, 31 fig, 15 tab, 24 ref.

Descriptors: *Rainfall-runoff relationships, Small watershed, *Model studies, *Design criteria, *Flood frequency, Flow characteristics, Wyoming, Analytical techniques, Regression analysis, Synthesis hydrology, Hydrographs, Road design, Culverts, Planning.

A flood-hydrograph study has defined the magnitude and frequency of flood volumes and flood peaks that can be expected from drainage basins smaller than 11 square miles in the plains and valley areas of Wyoming. Rainfall and runoff data, collected for 9 years on a seasonal basis (April through September), were used to calibrate a rainfall-runoff model on each of 22 small basins. Long-term records of runoff volume and peak discharges were synthesized for these 22 basins. Flood volumes and flood peaks of specific recurrence interval (2, 5, 10, 25, 50, and 100 years) were then related to basin characteristics with a high degree of correlation. Flood volumes were related to drainage area, maximum relief, and basin slope. Flood peaks were related to drainage area, maximum relief, basin slope, and channel slope. An investigation of ponding behind a highway embankment, with available storage capacity and with a culvert to allow outflow, has shown that the single fast-rising peak is most important in culvert design. Consequently, a dimensionless hydrograph defines the characteristic shape of flood hydrographs to be expected from small drainage basins in Wyoming. For design purposes, a peak and volume can be estimated from basin characteristics and used with the dimensionless hydrograph to produce a synthetic single-peaked hydrograph. Incremental discharges of the hydrograph can be routed along a channel, where a highway fill and culvert are to be placed, to help determine the most economical size of culvert if embankment storage is to be considered. (Woodard-USGS)

W79-03345

BANK-FULL DISCHARGE OF RIVERS,

Geological Survey, Denver, CO. Water Resources Div.

G. P. Williams.

Water Resources Research, Vol 14, No. 6, p 1141-

1153, December 1978. 2 fig, 3 tab, 51 ref, append.

Descriptors: *Streamflow, *Bank storage, *Flood plains, *Streamflow forecasting, Analytical techniques, Data collections, Gaging stations, Estimating, Equations, Channel morphology, Evaluation, *Bankfull discharge.

Eleven possible definitions of 'bankfull' have been used by various investigators. The active floodplain is the most meaningful bankfull level to the fluvial geomorphologist, whereas the banks of the valley flat are the most important to engineers. Comparison of 16 ways of determining bankfull discharge suggests that bankfull discharge at gaged sites should be obtained from the station's rating curve, where bankfull gage height is determined for a longitudinal profile of the floodplain along the entire reach. At ungaged sites, bankfull discharge can be estimated from the empirical equation of this study or from the Gauckler-Manning equation. Bankfull discharge does not have a common recurrence frequency among the rivers studied. (Woodard-USGS)

W79-03351

2F. Groundwater

GRAVITY ANALYSIS OF THE SUBSURFACE STRUCTURE OF THE UPPER SANTA CRUZ VALLEY, SANTA CRUZ COUNTY, ARIZONA,

Arizona Univ., Tucson. Dept. of Geosciences.

R. W. Parker.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 919, Price codes: A08 in paper copy, A01 in microfiche. M. S. Thesis, 1978. 58 p, 17 fig, 4 tab, 46 ref. OWRT A-078-ARIZ(2). 14-34-0001-7003 and -7006.

Descriptors: *Gravity survey, Groundwater, Southwest US, *Arizona, *Santa Cruz Valley(Ariz), Subsurface structure, Alluvium, Groundwater sources.

A gravity survey was conducted in the Upper Santa Cruz Valley, Santa Cruz County, Arizona. Residual gravity anomalies were interpreted to define the subsurface structure and to estimate the water resource potential. A north-south trending fault system with at least 2000 ft of vertical displacement forms the western half of the basin graben structure. The eastern basin boundary is a combination of northwest- and northeast-trending scarps. These scarps are all extensions of or parallel to inferred surface faults. The valley is divided into three major sections, each having a maximum thickness of 4200 ft of alluvium. Alluvium-covered sediments are present on both sides of the valley. The total volume of ground water available in storage in the Upper Santa Cruz Valley is calculated to be 24.3 million acre feet. This total volume of water is not entirely recoverable, because of permeability factors. The alluvium-covered area east of Nogales is not a basin, but rather is a pediment surface. An alluvium-covered area near Ruby is not sufficiently deep to be a major water resource. A two mile wide gravity low just northwest of Nogales contains about 2200 ft of alluvium and is the dominant subsurface feature of the southern third of the valley.

W79-03002

REMOTE SENSING DETECTION OF PERCHED WATER TABLES, A PILOT STUDY,

California Univ., Santa Barbara. Dept. of Geography.

For primary bibliographic entry see Field 4B.

W79-03040

PUBLIC GROUNDWATER SUPPLIES IN PLASKI COUNTY,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 4B.

W79-03043

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, I. A

Descriptors: *Drainage, *Soils, *Sands, *Water tables, *Model studies, Ephemeral streams, Discharge(Water), Equations, Mathematical models, Channels, Geomorphology, Water levels, Cross-sections, Drainage density, Depth, Profiles, Maps, Permeability, Channel morphology, Groundwater, *Channel geometry, *Hydraulic head ratio, Saturated thickness.

Institute for Land and Water Management Research, Wageningen (Netherlands).

L. F. Ernst.

Journal of Hydrology, Vol. 39, No. 1/2, p 1-30, October 1978. 20 fig, 4 tab, 23 ref.

Descriptors: *Drainage, *Soils, *Sands, *Water tables, *Model studies, Ephemeral streams, Discharge(Water), Equations, Mathematical models, Channels, Geomorphology, Water levels, Cross-sections, Drainage density, Depth, Profiles, Maps, Permeability, Channel morphology, Groundwater, *Channel geometry, *Hydraulic head ratio, Saturated thickness.

In the undulating areas in the eastern part of The Netherlands (elevation 5-30 m above sea level), only the largest drainage channels have a perennial discharge, while the smaller channels have an ephemeral discharge which is considerable in wet periods, but absent in dry periods. The usual drainage formulae cannot be applied satisfactorily in such situations. A considerable improvement can be obtained by taking into account the differences in channel size, the differences in open-water level, and the drain density (length per unit area) of all drains exceeding a certain bottom depth. The intensity of groundwater flow and open-water flow depends on the differences in height between phreatic surface, open-water level, and bottom depth. Although not strictly necessary, a constant ratio has been assumed for these hydraulic head values relative to the channel bottom in order to obtain a simple and still accurate formula for the relation between drain discharge from the area considered and depth of the phreatic surface below ground surface. (See also W79-03277) (Visocky-ISWS)

W79-03276

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, II. THE VARIABLE HYDRAULIC HEAD RATIO,

Institute for Land and Water Management Research, Wageningen (Netherlands).

L. F. Ernst.

Journal of Hydrology, Vol. 39, No. 1/2, p 31-50, October 1978. 14 fig, 3 tab, 13 ref.

Descriptors: *Drainage, *Soils, *Sands, *Water table, *Flow, *Model studies, Water levels, Hydrologic properties, Drainage area, Channel flow, Gradients(Streams), Depth, Channel morphology, Roughness coefficient, Equations, Mathematical models, Groundwater, Hydraulic head ratio, Saturated thickness.

In the preceding paper, a new drainage formula was given, the derivation of which was based mainly on an analysis of the question of how much groundwater flow depends on the permeability of the underlying ground and on the often rather complex geometric properties of the channel network in the drainage basin considered. In this paper, due consideration also was given to the open-water flow, requiring the investigation of other hydrologic properties such as the average relations between drainage area, channel gradient, roughness coefficient, and channel size. The hydraulic head ratio between groundwater flow and open-water flow strongly depends on the bottom depth of the drainage channel and on the depth of the phreatic surface. By substitution of an adequate expression for this hydraulic head ratio into the basic drainage formula, the final expressions could be improved, especially regarding the distribution of the groundwater discharge to the large drainage channels. For wet conditions, this is not of major significance on the relation between total discharge and groundwater depth. (See also W79-03276) (Visocky-ISWS)

W79-03277

DRAINAGE BY PARTIALLY PENETRATING RECHARGE WELLS IN A LEAKY AQUIFER,

India Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.

P. K. Chowdhury, and B. Anjaneyulu.

Field 2—WATER CYCLE

Group 2F—Groundwater

Journal of Hydrology, Vol. 39, No. 1/2, p. 51-57, October 1978. 5 fig, 2 ref.

Descriptors: *Drainage, *Model studies, *Recharge wells, Drainage wells, Recharge, Wells, Groundwater, Groundwater recharge, Equations, Laboratory tests, Aquifers, *Partial penetrating recharge wells, Leaky aquifer, Penetration ratio, Recharge rate.

Recharge wells can be considered as a possible solution for the drainage of waterlogged areas which have no gravity outlets. A knowledge of the capacity of the recharge wells is useful in estimating the number of wells needed to provide drainage relief to a particular area. Laboratory experiments were conducted on a sand model simulating a leaky artesian aquifer underlying an unconfined aquifer. The unconfined aquifer in the model was overlain by topsoil which was kept ponded to simulate a waterlogged condition. The recharge characteristics of a well partially penetrating the leaky artesian aquifer were studied under different conditions. Based on experimental data, empirical equations were proposed for predicting the recharge rate. (Lee-ISWS)

W79-03278

IDENTIFICATION OF HYDRODISPERSIVE MASS-TRANSFER PARAMETERS IN AQUIFERS BY INTERPRETATION OF TRACER EXPERIMENTS IN RADIAL CONVERGING OR DIVERGING FLOW (IDENTIFICATION DES PARAMETRES DE TRANSPORT HYDRODISPERSIF DANS LES AQUIFERS PAR INTERPRETATION DE TRACAGES EN ECOULEMENT CYLINDRIQUE CONVERGENT OU DIVERGENT), Bureau de Recherches Géologiques et Minières, Orléans (France).

J. P. Sauty.

Journal of Hydrology, Vol. 39, No. 1/2, p. 69-103, October 1978. 20 fig, 1 tab, 34 ref.

Descriptors: *Groundwater movement, *Analytical techniques, *Model studies, *Aquifers, Mathematical models, Analysis, Numerical analysis, Dispersion, On-site investigations, Flow, Tracers, Radial flow, Type curves, Finite difference analysis.

Tracer field measurements on groundwater radial flow yield the mass-transfer parameters economically, when performed on wells already equipped with satellite piezometers. The interpretation of the restitution curve gives rise to some difficulty as there is practically no exact analytical solution to mass transfer radial flow, either diverging (central injection) or converging flow (central pumping and injection of tracer in the satellite piezometer) with continuous or instantaneous injection. This paper presented a simple finite-difference method, free of any numerical dispersion, for the integration of transfer in radial flow equations. It was shown, by calculation of average concentrations on concentric circles, that transversal dispersion has no effect (in the hypothesis of pure hydrodispersive transfer) on the concentration measured in the central well (in the case of central pumping). Programs based on this method allows, with the use of proper dimensionless parameters, the building of type curves for each combination of flow direction and injection mode. It was shown that in each of the four studied cases, there exists an approximate analytical formula which fits the real curves as long as the Peclét number is high enough (over 3). Automatic and manual methods were proposed in order to apply the results to the identification of effective porosity and dispersivity. Several examples of manual identification were given for monolayer aquifer cases, and even for a two-layer case. (Humphreys-ISWS)

W79-03279

A METHOD FOR THE ANALYSIS OF DRAWDOWN FROM MULTIPLE-SOURCE TEST PUMPING,

Southern Water Authority, Eastleigh (England), Directorate of Resource Planning.

For primary bibliographic entry see Field 4B.

W79-03283

SIMULATION OF GROUNDWATER MOUND PERCHING IN LAYERED MEDIA, Southwestern Great Plains Research Center, Bushland, TX.

A. D. Schneider, and J. N. Luthin.

Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 5, p 920-923, 930, September-October 1978. 5 fig, 10 ref.

Descriptors: *Groundwater, *Recharge, *Model studies, *Mathematical models, Artificial recharge, Infiltration, Percolation, Permeability, Impervious soils, Hydraulic conductivity, Steady flow, Groundwater movement, Hydrology, Groundwater recharge, *Perching, *Perched mounds, Groundwater mounds, Perching conditions, Semipermeable layers.

Formation of perched groundwater mounds was analyzed through numerical analysis of coupled saturated-unsaturated soil water flow. The steady state soil water flow equation was solved by the Alternating Direction Implicit (ADI) numerical technique with iteration to remove the nonlinearity. In the numerical model, hydraulic conductivities, recharge rates, and flow domain geometry were varied to observe the important parameters affecting the formation of perched water table. The rate of formation of perched water tables depended primarily on the recharge rate and the saturated hydraulic conductivity of a semi-permeable, subsurface layer. If the ratio of the recharge rate to this hydraulic conductivity was less than 10, a perching condition did not exist. When the ratio ranged from 10 to 25, the perching condition was weak. When the ratio greater than 25, the perching condition was strong. (Sims-ISWS)

W79-03301

INFILTRATION FROM TRIBUTARY STREAMS IN THE SUSQUEHANNA RIVER BASIN, NEW YORK,

Geological Survey, Albany, NY. Water Resources Div.

A. D. Randall.

Journal of Research of the U.S. Geological Survey, Vol. 6, No. 3, p 285-297, May-June 1978. 6 fig, 2 tab, 19 ref.

Descriptors: *Groundwater recharge, *Infiltration rates, *Surface-groundwater relationships, *Natural recharge, *Streambeds, Permeability, Hydrogeology, Seepage, Water loss, Hydraulic conductivity, Streams, New York, *Susquehanna River basin.

As tributary streams in the Susquehanna River basin in New York leave narrow upland valleys and enter larger valleys floored with permeable stratified glacial drift, they lose water by infiltration through streambeds. The infiltration rate is generally slow near the point of entering a larger valley, but farther downstream it is much faster and is approximately constant per unit distance along a given stream. A conservative average value of infiltration rate in the downstream reach is 10 liters per second per 100 meters of channel. Infiltration from these streams is little influenced by stream width, depth, or temperature and seems to be controlled by permeability distribution beyond the streambed in the alluvium or underlying glacial drift rather than by permeability at the streambed. Hydraulic conductivity of earth materials near each of the streams studied was calculated by applying models that describe steady-state saturated flow into isotropic materials with various boundary conditions. Hydraulic conductivities of 4 to 41 meters per day were obtained; 13 meters per day is suggested as a conservative average value for silty gravel alluvium in the Susquehanna River basin. (Woodard-USGS)

W79-03335

THE HYDROTHERMAL SYSTEM OF LONG VALLEY CALDERA, CALIFORNIA, Geological Survey, Menlo Park, CA. Water Resources Div.

For primary bibliographic entry see Field 4B.
W79-03343

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCE-MID-ATLANTIC REGION,

Geological Survey, Reston, VA. Water Resources Div.

For primary bibliographic entry see Field 4B.

W79-03344

WELL-RESPONSE MODEL OF THE CONFINED AREA, BUNKER HILL GROUND-WATER BASIN, SAN BERNARDINO COUNTY, CALIFORNIA,

Geological Survey, Menlo Park, CA. Water Resources Div.

For primary bibliographic entry see Field 4B.

W79-03347

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,

Rhode Island Univ., Kingston. Dept. of Geology.

R. K. Froehlich.

Water Resources Bulletin, Vol. 14, No. 4, p. 931-941, August 1978. 8 fig, 2 tab, 8 ref.

Descriptors: *Streams, *Channels, *Residual gravity, Hydraulics, *Glacial, Transmissivity, Groundwater resources, Geophysics, Equations, *Rhode Island, Saturated thickness, Bedrock depth.

Buried glacial stream channels contain large and easily accessible groundwater resources. Gravity surveys have been frequently applied for their location. A gravity survey in the geohydrologically explored Wood River Valley Area of southern Rhode Island shows extreme lows of -2mgals over channel depths of maximal 300 feet. Three gravity profiles were observed in east-west direction across a north-south striking stream channel. The bedrock depth increases rapidly towards the south from 130 to 300 feet. The gravity lows observed across each profile are not related to the bedrock depth but rather to the saturated thickness of the main aquifer and its hydraulic transmissivity. Well logs indicate that the large change of bedrock depth is solely due to an increase of till of low permeability. The volume of the glacial outwash, which is the major groundwater resource, changes little underneath the three profiles. The gravity lows appear to be directly related to the density contrast between glacial outwash and till. The response to the hydraulically more pertinent units renews the interest in the gravity method as it may have a potential to estimate yields of hydrological complex aquifers. (Bell-Graf)

W79-03417

2G. Water In Soils

STATE-OF-THE-ART SURVEY OF LAND RECLAMATION TECHNOLOGY,

Little (Arthur D.), Inc., Cambridge, MA.

For primary bibliographic entry see Field 5E.

W79-03025

TRANSIENT AND STEADY FLOW FROM SUBSURFACE LINE SOURCES AT CONSTANT HYDRAULIC HEAD IN ANISOTROPIC SOIL,

Science and Education Administration, Riverside, CA. Salinity Lab.

C. Dirksen.

Transactions of the American Society of Agricultural Engineers, Vol. 21, No. 5, p 913-919, September-October 1978. 12 fig, 17 ref.

Descriptors: *Soil water, *Soil water movement, *Subsurface flow, *Subsurface irrigation, Infiltration, Hydraulic conductivity, Wetting, Drying, Unsteady flow, Steady flow, Pressure, Moisture content, Drainage, Isotropy, Soil properties, Soil science, Wetting fronts, Hydraulic head.

WATER CYCLE—Field 2

Water In Soils—Group 2G

Water content and pressure head distributions were measured during transient and steady flows from 4 equally spaced line sources maintained at constant hydraulic head in very fine sand in a large laboratory model. Theory and experiment agreed reasonably well. The major differences were a much reduced upward flow and an increased lateral flow below the sources in the experiments. This, and considerations concerning differences in horizontal versus vertical flow between sources, indicated that the soil column exhibited varying degrees of anisotropy, with the hydraulic conductivity being greater horizontally than vertically. After initial wetting, water contents changed little until the wetting fronts reached the bottom. Then the water began to accumulate from the bottom upward. Differences in infiltration rates between sources were predominantly determined by conditions around the sources and were reflected in rates of advance of the wetting fronts, rather than the water content in the regions of uniform flow farther below the sources. Subsequent drainage of the sand provided data for determining the hydraulic conductivity functions and the soil water characteristics. At the same water content, the hydraulic conductivity during wetting was only about half that during drying. (Sims-ISWS) W79-03048

THEORY AND SYSTEM OF AUTOMATIC DETERMINATION OF SOIL MOISTURE CHARACTERISTICS AND UNSATURATED HYDRAULIC CONDUCTIVITIES,

Institute for Land and Water Management Research, Wageningen (Netherlands).

D. Boels, J. B. H. M. Van Gils, G. J. Veerman, and K. E. Wit.

Soil Science, Vol 126, No 4, p 191-199, October 1978. 6 fig, 3 tab, 24 ref.

Descriptors: *Soil moisture, *Hydraulic conductivity, *Unsaturated flow, Model studies, Water pressure, Depth, Equations, Darcys law, Measurement, Instrumentation, Data processing, Theoretical analysis, Mathematical models, Infiltration, Laboratory tests, Soil cores.

The moisture characteristic and the unsaturated hydraulic conductivity were calculated from the measured water pressures at different depths in a soil core and the weights during evaporation at the top of the core. The measured water pressure was assumed to represent the mean pressure in a layer of a certain thickness, and the moisture characteristic was assumed to be described with sufficient accuracy by a polynomial. The tangent of the polynomial in each pressure interval was solved from a set of equations. Assuming that the hydraulic conductivity-water pressure relationship can be described by an exponential relationship with varying constants in the different pressure ranges, the constants can be solved from measured water pressure at two depths and three sequential moments and from the rate of change in water content below some defined depth in the core during two sequential time periods. Up to 10 cores can be handled at the same time. Measuring at a core can be started and stopped at any time. The water pressure at different depths was measured with one pressure transducer, connected with a scannivale; the weight was measured with a strain-gage load cell; and the data were recorded on a magnetic cassette tape. The recorded data were processed by a computer and stored on a magnetic disc. If the saturated conductivity is relatively high, a steady-state infiltration method is applied to determine the unsaturated hydraulic conductivity at high water contents. (Visocky-ISWS) W79-03049

IN SITU HYDRAULIC CONDUCTIVITY OF A FRAGIPAN SOIL IN THE SOUTHERN COASTAL PLAINS,

Georgia Univ., Athens.
K. G. Prasad, and H. F. Perkins.

Soil Science, Vol 126, No 5, p 263-268, November 1978. 3 fig, 2 tab, 21 ref.

Descriptors: *Hydraulic conductivity, *Soil types, *Coastal plains, Land use, Perched water, Perme-

ability, Root development, Soil properties, Porosity, Bulk density, Soil horizons, Equipment, Drainage, *Fragipan, In-situ measurement.

More than 250,000 ha of soils having a fragipan or fragic properties occur in the Southern Coastal Plains Soil Province. These soils have moderate to severe land use restrictions, partially due to perched water, slow permeability, and restricted root growth. The Cowarts soil (Fragic Paleudults; fine-loamy, siliceous, thermic family), which is developed from marine sediments, was selected to determine in situ hydraulic conductivities and related hydrological properties. The moderately well-expressed fragipan has higher bulk density, less pore space, smaller pores, less available water, and lower hydraulic conductivity values than horizons above or below the pan. With an increase in hydraulic head, an increase in hydraulic conductivity was less in the fragipan than in associated horizons. (Visocky-ISWS) W79-03050

SPATIAL VARIABILITY OF SOIL WATER PROPERTIES IN TROPICAL SOILS OF NIGERIA,

Ibadan Univ. (Nigeria). Dept. of Agronomy.

O. Babalola.

Soil Science, Vol 126, No 5, p 269-279, November 1978. 4 fig, 7 tab, 14 ref.

Descriptors: *Soil water, *Tropical regions, *Soil properties, *Spatial distribution, Nuclear meters, Hydraulic conductivity, Moisture content, Bulk density, Soil types, Infiltration, Frequency curves, Equations, On-site investigations, Drainage, *Nigeria.

The internal drainage technique, which employs a neutron moisture meter and tensiometers, was used to evaluate the spatial variability of soil water properties of a 0.34 and 91.6-ha field. The precision with which the soil hydraulic conductivity K , as a function of moisture content θ , could be obtained for a single soil type in the field also was determined. High variability in soil physical properties, such as percent gravel, sand, silt, and clay, and bulk density, resulted in a high variability in soil water retention characteristics and hydraulic conductivity. The coefficients of variability of these soil properties were only slightly higher for the 91.6-ha farm area than for the 0.34-ha area, consisting of one soil type on a nearly level topography. Although the spatial variability of soil water content was relatively low at any time and any depth after cessation of infiltration, ranging from 2.48 to 12.06%, the hydraulic conductivity values were far more divergent, having coefficients ranging from 47.6 to 146.9%. Steady-state moisture content and hydraulic conductivity were normally and log-normally distributed, respectively. The magnitude of soil water flux at any depth was predicted with some success, using a simple prediction equation that requires a knowledge of saturated hydraulic conductivity and the slope of the $K(\theta)$ curve near saturation. (Visocky-ISWS) W79-03051

DERIVATION OF EQUATIONS FOR VARIABLE RAINFALL INFILTRATION,

Colorado State Univ., Fort Collins. Engineering Research Center.

H. J. Morel-Seytoux.

Water Resources Research, Vol. 14, No. 4, p 561-568, August 1978. 7 fig, 2 tab, 9 ref, 2 append.

Descriptors: *Infiltration, *Rainfall, *Ponding, *Mathematical models, Model studies, Equations, Theoretical analysis, Moisture content, Soil water, Porous media, Soils, Hydrology, Ponding time, Variable rainfall.

Formulas were derived for prediction of ponding time and cumulative infiltration following ponding under a condition of piecewise variable and even intermittent rainfall. The derivations do not assume immediate saturation at the surface or a piston displacement of air by water; they include the viscous flow of air. The results were compared with experimental data of James and Larson for

two conditions: constant rainfall and intermittent rainfall. The proposed formulas are simple to use, requiring no complex solution of a partial or even an ordinary differential equation. The numerical calculations presented in the paper were performed with a small pocket calculator. The agreement with experimental data is good. (Sims-ISWS) W79-03052

ARSENIC STABILITY IN CONTAMINATED SOILS,

Missouri Univ.-Columbia. Dept. of Agronomy.

For primary bibliographic entry see Field 5A.

W79-03059

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME IV. APPENDIX C: HYDROLOGY; APPENDIX D: GEOLOGY, SOILS AND MATERIALS.

Army Engineer District, St. Louis, MO.

For primary bibliographic entry see Field 6B.

W79-03167

NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,

Nova Scotia Technical Coll., Halifax. Dept. of Bio-Resources Engineering.

For primary bibliographic entry see Field 5D.

W79-03178

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, I. A DRAINAGE FORMULA BASED ON A CONSTANT HYDRAULIC HEAD RATIO,

Institute for Land and Water Management Research, Wageningen (Netherlands).

For primary bibliographic entry see Field 2F.

W79-03276

DRAINAGE OF UNDULATING SANDY SOILS WITH HIGH GROUNDWATER TABLES, II. THE VARIABLE HYDRAULIC HEAD RATIO,

Institute for Land and Water Management Research, Wageningen (Netherlands).

For primary bibliographic entry see Field 2F.

W79-03277

AN AUTOMATIC SCANNING RECORDING TENSIOMETER SYSTEM,

Bristol Univ. (England). Dept. of Geography.

T. H. L. Williams.

Journal of Hydrology, Vol. 39, No. 1/2, p 175-183, October 1978. 3 fig, 6 ref.

Descriptors: *Soil moisture, *Soil physics, Soil science, Soil water movement, Temperature, *Tensiometers, Effects, Equations, Automation, Testing, *Automatic tensiometer system, Response time, and the effects of temperature on the system were discussed. (Lee-ISWS) W79-03051

A rapid-response, automatic tensiometer scanning system was developed to provide continuous on-site recording of soil moisture conditions. The system employs a 24-way fluid wafer switch to connect 22 tensiometer units sequentially to a pressure transducer, registering on a chart recorder. Constructional details of the system were given at the response time, and the effects of temperature on the system were discussed. (Lee-ISWS) W79-03282

BROMACIL IN LAKELAND SOIL GROUND WATER,

Southeastern Forest Experiment Station, Marion, FL.

For primary bibliographic entry see Field 5B.

W79-03291

MOTTLING IN SOIL PROFILES CONTAINING A COARSE-TEXTURED HORIZON,

Department of Scientific and Industrial Research, Palmerston North (New Zealand). Plant Physiology Div.

Field 2—WATER CYCLE

Group 2G—Water In Soils

B. E. Clothier, J. A. Pollock, and D. R. Scotter. Soil Science Society of America Journal, Vol. 42, No. 5, p 761-763, September-October 1978. 3 fig, 10 ref.

Descriptors: *Soil texture, *Drainage, *Model studies, Mathematical models, *Soil horizons, *Soil profiles, Soil properties, Hydraulic conductivity, Soil water, Soil water movement, Iron, Manganese, Chemical precipitation, Soil science, *Soil mottling.

Mottling often characteristically occurs in fine-textured soil just above an underlying coarse-textured layer. Interpretation of such mottling as representing a normal drainage impedance is misleading as a perched or groundwater table may never occur in the profile. In this paper, a simple soil water drainage model was discussed that aids interpretation of the pattern of mottling in a soil horizon above a coarse-textured layer. Also, the influence of various soil physical parameters on mottling phenomena was analyzed, suggesting that the more coarse-textured the underlay the greater the propensity to mottle. The tendency to mottle was shown to be greatest in the soil immediately above the coarse-textured layer. The model was applied to the naturally layered Manawatu fine sandy loam, a Dystric Fluventic Eutrochrept. (Sims-ISWS).
W79-03300

SIMULATION OF GROUNDWATER MOUND PERCHING IN LAYERED MEDIA,
Southwestern Great Plains Research Center, Bushland, TX.
For primary bibliographic entry see Field 2F.
W79-03301

SOIL MOISTURE DETERMINATION USING MICROWAVE RADIATION,
Connecticut Agricultural Experiment Station, New Haven.
L. Hankin and B. L. Sawhney. Soil Science, Vol. 126, No. 5, p 313-315, November 1978. 1 fig, 4 tab, 5 ref.

Descriptors: *Soil moisture, *Moisture content, *Laboratory tests, *Microwaves, Heating, Drying, Soils, Soil water, Soil types, Analytical techniques, Soil analysis, Soil science, Microwave ovens.

The advantages of microwave treatment over conventional heating are simplicity of operation and a saving of time. A simplified method for soil moisture determination using ordinary filter paper folded into cups for holding the sample was described. The microwave source was a microwave oven rated to deliver 625 W (high power) at a wavelength of 2450 MHz. A filter paper cup, including another piece of tape to seal the top, was weighted, and about a 10-g sample was placed in it and weighed. The cup containing the soil sample was placed in the center of the floor of the microwave oven, and the cup and contents were treated for 3 min. The filter paper cup then was turned over and treated for an additional 3 min. After the cup was removed from the oven, air was allowed to flow over it for 30 sec in a fume hood or with a fan. The cup and contents then were weighed, and the percent moisture was calculated. Soil moisture determinations also were made by the conventional procedure of drying samples at 110°C for 18 h. The use of a microwave oven as the heat source to determine the moisture content of soils was found to be speedy and satisfactory. (Sims-ISWS).
W79-03303

RELATIONSHIP TO EXTRACTABLE SOIL MANGANESE TO SOIL PROPERTIES,
Georgia Univ., Experiment Dept. of Agronomy.
L. M. Shuman, and O. E. Anderson. Soil Science Society of America Journal, Vol. 42, No. 4, p 666-667, July-August, 1978. 2 tab, 8 ref.

Descriptors: *Manganese, *Soil chemical properties, Soil physical properties, Ammonium compounds, Organic matter, Cation exchange, Greenhouses, *Soil chemistry.

In a greenhouse experiment eight Southeastern soils were amended to give pH levels of 4.8, 5.8, and 6.8 and were treated with 0, 25, and 50 ppm Mn. After growing wheat (*Triticum aestivum* L.) for 40 days, the soils were extracted for Mn using six extractants: H₂O, neutral 1N NH₄OAc (with and without 0.2% hydroquinone), 'double acid', diethylenetriaminepentacetic acid (DTPA) and ethylenediamine-di-o-hydroxyphenyl-acetic acid (EDDHA). Except for the low-Mn soils, greater differences in extractable Mn were observed among soil types and soil pH levels than among Mn rates. Extractable Mn was correlated with soil clay content and total soil Mn. Organic matter content with a narrow range from 1.0 to 2.9%, silt content and cation exchange capacity (CEC) were not correlated with extractable Mn. The extractable Mn decreased as soil pH increased for the H₂O, NH₄OAc alone, and DTPA extractants making them preferable for predicting soil Mn availability since higher pH causes Mn to be less available to the plant. (Skogerboe-Colorado State)
W79-03360

COMPARISON OF ASSOCIATIONS OF DIFFERENT HYDROCARBONS WITH CLAY PARTICLES IN SIMULATED SEAWATER,
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.

For primary bibliographic entry see Field 5B.
W79-03364

HYDRAULIC CONDUCTIVITY OF UNSATURATED POROUS MEDIA: GENERALIZED MACROSCOPIC APPROACH,
Colorado State Univ., Fort Collins. Engineering Research Center.

Y. Mualem. Water Resources Research, Vol. 14, No. 2, p 325-334, April, 1978. 2 fig, 5 tab, 41 ref.

Descriptors: *Unsaturated flow, *Hydraulic conductivity, *Porous media, Permeability, Moisture content, Statistical methods.

The macroscopic approach which yields the power function relationship between the relative permeability (K sub r) and the effective saturation (S sub e), K sub r = (S sub e) to the n th power, was generalized to allow n to vary with the soil type. The proposed macroscopic approach was verified by the experimental results of 50 soils. It rendered the power function model of (relative permeability - actual volumetric water content) a flexibility it lacked before by relating the power n to the energy per unit volume required to drain a saturated soil to the wilting point. The proposed model is shown to be an efficient tool for the prediction of the hydraulic conductivity. (Skogerboe-Colorado State)
W79-03397

MICROBIAL ASPECTS OF THE VOLATILE LOSS OF APPLIED MERCURY (II) FROM SOILS,
Oregon State Univ., Corvallis. Dept. of Soil Science; and Oregon State Univ., Corvallis. Dept. of Agriculture Chemistry.

For primary bibliographic entry see Field 2K.
W79-03419

POTENTIAL USE OF FINELY DISINTEGRATED IRON PYRITE IN SODIC AND IRON-DEFICIENT SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.

P. L. G. Vlek, and W. L. Lindsay. Journal of Environmental Quality, Vol. 7, No. 1, p 111-114, January-March, 1978. 3 fig, 3 tab, 15 ref.

Descriptors: *Pyrite, *Oxidation, Sulfur, Fertilizers, *Mine wastes, Soil amendments, *Colorado.

The rate of chemical oxidation of iron pyrite in water was measured as a function of particle size. Reducing the particle size greatly increased the rate of oxidation. For pyrite > 250 microns, the pH of the solution leveled off at 5 after 6 hours

while the clay size pyrite dropped to pH 4 within 24 hours. In these studies, pyrite was applied at 1% initially with an additional 1% after 1 month to a slightly sodic, iron-deficient, loamy sand soil from Colorado. The soil/water ratio was 1:2. When clay size pyrite was used, the pH of the soil decreased from 8.3 to 7.8 after 1 mo and to 5.7 after 2 mo. The coarser pyrite decreased the pH only slightly. No significant change in the composition of exchangeable ions occurred during the first month, but the composition had changed sufficiently after 2 mo to flocculate the clay. The DTPA-extractable iron increased from 1.5 to 64 ppm for the finest pyrite treatment during 1 mo, copper doubled, and manganese quadrupled during this period. Finely disintegrated pyrite may be useful for reclaiming slightly sodium-affected soils or for providing slow release available iron. (Skogerboe-Colorado State)
W79-03423

THE MECHANISM OF SULFATE ADSORPTION ON IRON OXIDES,
Griffith Univ., Nathan (Australia). School of Science.

For primary bibliographic entry see Field 2K.
W79-03428

THE ACETYLENE INHIBITION METHOD FOR SHORT-TERM MEASUREMENT OF SOIL DENITRIFICATION AND ITS EVALUATION USING NITROGEN-15,
Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.

For primary bibliographic entry see Field 2K.
W79-03429

SALT OUTFLOWS FROM NEW AND OLD IRRIGATION LANDS,
Snake River Conservation Research Center, Kimberly, ID.
For primary bibliographic entry see Field 3C.
W79-03442

A SOIL MOISTURE BUDGET MODEL ACCOUNTING FOR SHALLOW WATER TABLE INFLUENCES,
Purdue Univ., Lafayette, IN. Dept. of Agronomy. R. G. Stuff, and D. F. Dale. Soil Science Society of America Journal, Vol. 42, No. 4, p 637-643, July-August, 1978. 9 fig, 1 tab, 15 ref, 10 equ.

Descriptors: *Soil moisture, *Evapotranspiration, *Capillary water, Water balance, Field capacity, *Moisture deficit, Computer models, *Water table.

Soil moisture balance programs developed on well-drained soils were found to be unsatisfactory for a soil underlain by shallow water tables, a condition typical of about 9 million acres of cropland in Indiana. Capillary rise past a 105-cm root zone boundary was estimated as the difference between estimated evapotranspiration (ET) and changes in soil moisture under corn (*Zea mays* L.) on a tile-drained Typic Argiaquoll at West Lafayette, Ind. during three growing seasons, 1971-1973. Capillary water was found to supply an average of 27% of the ET in periods with little or no precipitation. Computer model estimates showed capillary water to furnish about 17% of the total ET over a 100-day period from 49 days before silking to 50 days after. The derived relationships with those obtained from literature sources and assumptions regarding runoff and recharge were programmed in a computer model for simulating the daily moisture status and changes in the corn root zone. Model inputs were pan evaporation, precipitation, soil moisture characteristics, corn silking date, and initial soil moisture conditions. The model was found to closely track measurements of both soil moisture and water table depths in four independent seasons: early and late plantings in 1970 and 1974. (Skogerboe-Colorado State)

W79-03481

WATER CYCLE—Field 2

Water In Plants—Group 2I

For primary bibliographic entry see Field 5C.
W79-03478

SOME PATTERNS OF CHANGE IN LACUSTRIAL ECOSYSTEMS UNDER ANTHROPOGENIC INFLUENCE,
Polish Academy of Sciences, Warsaw. Inst. of Ecology.

For primary bibliographic entry see Field 5C.
W79-03479

2I. Water In Plants

A FIELD STUDY OF THE EFFECT OF WATER DEFICIT ON WATER USE EFFICIENCY,
Kansas Water Resources Research Inst., Manhattan.

E. T. Kanemasu.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 761, Price codes: A04 in paper copy, A01 in microfiche. Contribution No 201, October 1978. 49 p. OWRT A-085-KAN(1). 14-34-0001-7036.

Descriptors: *Water stress, Rainout shelter, Canopy temperature, *Water utilization, *Transpiration, *Photosynthesis, *Sorghum, *Soybeans.

In order to study water deficits in the field, it is necessary to control natural precipitation without significantly modifying the other meteorological parameters (solar radiation, temperature, humidity and wind speed). A large (40' x 40') rainout shelter was constructed which automatically covered the experimental plots during periods of rainfall. Experiments were conducted on well-watered and stressed sorghum and soybeans. On both crops, photosynthesis and transpiration were reduced when the available soil moisture decreased below 35% of the maximum available water. Canopy temperatures of sorghum and soybean under well-water conditions were near 33 and 31°C. Leaf temperature increased over air temperature during water stress periods.

W79-03036

LOCALIZATION OF CHITIN IN ALGAL AND FUNGAL CELL WALLS BY LIGHT AND ELECTRON MICROSCOPY,
Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.

For primary bibliographic entry see Field 5C.

W79-03111

FACTORS REGULATING THE DISTRIBUTION AND POPULATION DYNAMICS OF THE AMPHIPOD GAMMARUS PALUSTRIS IN AN INTERTIDAL SALT MARSH COMMUNITY,
Maryland Univ., College Park. Dept. of Zoology. R. F. Van Dolah. PhD Dissertation, 1977. 101 p.

Descriptors: *Salt marshes, Aquatic population, *Amphipods, Distribution, *Gammarus palustris, Aquatic plants.

Seasonal changes in the intertidal distribution, abundance, and population dynamics of the epifaunal amphipod *Gammarus paustus* were studied in salt marshes bordering two estuarine rivers located in the Chesapeake Bay. In both rivers, low amphipod densities occurred during the winter corresponding with a subtidal migration. Migrations did not account for the low numbers observed at other times and an examination of the life cycle of this species as well as an egg-ratio analysis of the populations indicated that low densities during the summer or late summer and fall were not due solely to life cycle events. Insufficient tolerance to freezing temperatures was postulated as the reason for the distributional shift to subtidal areas during the winter. Amphipod distribution within the intertidal zone at other times of the year was highly correlated with *Spartina* density. Birth rate and average brood size declined during the early summer as a result of natural adult female

DETERMINING SOIL GYPSUM CONTENT AND EXPRESSING PROPERTIES OF GYPSIFEROUS SOILS,

National Soil Survey Lab., Lincoln, NE.

R. E. Nelson, L. C. Klameth, and W. D. Nettleton. Soil Science Society of America Journal, Vol 42, No 4, p 659-661, July-August, 1978. 1 fig, 2 ref, 18 equ.

Descriptors: *Gypsum, Sulfates, Soil water, *Soil chemical properties, Soil tests, *Soil chemistry.

The standard method for measuring the gypsum content of soils is a lengthy one, partly because of the presence of Na and Mg sulfates in most gypsiferous horizons, and partly because of the difficulty in dissolving all the gypsum in the sample. A more rapid method, sufficiently accurate for taxonomic uses, has been developed and is based on loss of crystal water of gypsum upon heating to 105°C. Percent gypsum, calculated on an oven-dry weight basis from loss of crystal water, equals $1.038 \times$ percent gypsum by the standard chemical method + 0.17. The standard error of estimate for the new method is plus or minus 1.8% gypsum. Equations are given for expressing properties of gypsiferous soils on an oven-dry + crystal water of gypsum weight basis. (Skogerboe—Colorado State)

W79-03491

2H. Lakes

UTILITY LINE SITING AND WETLAND PRESERVATION,

Wisconsin Univ. Madison. Land Resources.

For primary bibliographic entry see Field 4C.
W79-03090

CHANGES IN THE AQUATIC MACROPHYTE FLORA OF WHITEWATER LAKE NEAR SUDSBURY, ONTARIO FROM 1947 TO 1977,

Guelph Univ., (Ontario). Dept. of Botany and Genetics.

For primary bibliographic entry see Field 5C.
W79-03177

ECOLOGICAL STUDIES ON INDONESIAN LAKES, THE MONTANE LAKES OF BALI,

Cambridge Univ. (England). Dept. of Biology.
For primary bibliographic entry see Field 5C.
W79-03180

DISTRIBUTION AND ABUNDANCE OF PHYTOPLANKTON IN 153 LAKES, RIVERS, AND POOLS IN THE NORTHWEST TERRITORIES,

Canada Environmental Protection Service, Yellowknife (Northwest Territories).

For primary bibliographic entry see Field 5C.

W79-03185

ORGANIC CARBON-A NONSPECIFIC WATER QUALITY INDICATOR FOR LAKE SUPERIOR,

Minnesota Univ., Minneapolis. Dept. of Civil Mineral Engineering.

For primary bibliographic entry see Field 5A.
W79-03186

ENERGY FLUX AND WAVE ACTION IN GRAVITY WAVES PROPAGATING ON A CURRENT,

Technical Univ. of Denmark, Lyngby. Inst. of Hydrodynamics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W79-03294

THE DAMPING OF SOLITARY WAVES,

Coastal and Marine Engineering Research Inst., Haifa (Israel).

For primary bibliographic entry see Field 8B.
W79-03295

EFFECT OF ORGANIC COLOR AND TURBIDITY OF SECCHI DISK TRANSPARENCY,

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.

P. L. Brezonik.

Journal of the Fisheries Research Board of Canada, Vol. 35, No. 11, p 1410-1416, November 1978. 4 fig, 2 tab, 18 ref.

Descriptors: *Secchi disks, *Turbidity, *Color, *Florida, Chlorophyll, Plankton, Lakes, Trophic level, Light penetration, Regression analysis, Data processing, Mathematical models, Limnology, *Organic color, *Transparency.

Secchi disk transparency in lakes is a function not only of the turbidity caused primarily by plankton, but also of the organic color level in the water. Multiple regression analysis of data from 55 Florida lakes yielded a close-fitting equation of the type $1/SD = a(\text{Color}) + b(\text{Turbidity}) + c$. The statistical relationships between inverse transparency and chlorophyll a and between log transparency and log chlorophyll a exhibited greater scatter. Experiments in which concentrated solutions of humic substances were added to a large plastic "limno-bag" verified the linear relationship between $1/SD$ and color content, but yielded a different slope than that obtained by regression analysis. The maximum possible transparency (assuming zero turbidity) was similar for both the experimental and regression relationships at color levels above 50 platinum (Pt) units, but increasingly divergent results were predicted by the two approaches at lower color levels. At a color of 100 Pt units, the maximum Secchi disk transparency is about 2.4-2.8 m. Because of the crudeness of transparency measurements, use of the above regression equation to compute transparencies from measured turbidities appeared to be more reliable than use of the experimentally derived equation. (Sim-ISWS).
W79-03034

CONIFER NEEDLE PROCESSING IN A SUB-ALPINE LAKE,

Washington Univ., Seattle. Coll. of Forest Resources.

For primary bibliographic entry see Field 5B.
W79-03400

LAKE QUALITY DISCRIMINANT ANALYSIS,

Michigan State Univ., East Lansing. Dept. of Resource Development.

For primary bibliographic entry see Field 5C.
W79-03422

WATER + WEEDS + HEAT = NOVEL EXPERIMENTATION,

Beak Consultant Ltd., Calgary (Alberta).

For primary bibliographic entry see Field 5G.
W79-03456

EVIDENCE OF RESISTANCE TO METALS IN LARVAE OF THE MIDGE CHIRONOMUS TENTANS IN A METAL CONTAMINATED LAKE,

Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.

For primary bibliographic entry see Field 5C.
W79-03464

TWO TYPES OF FISH ATTRACTORS COMPARED IN LAKE TOHOPEKALIGA, FLORIDA,

Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
For primary bibliographic entry see Field 8I.
W79-03469

BASIC ASPECTS OF THE ANTHROPOGENIC TRANSFORMATION OF LAKE ECOSYSTEMS OF THE NORTHWEST OF THE EUROPEAN PART OF THE USSR,

Akademija Nauk SSSR, Leningrad. Inst. of Lake Management.

Field 2—WATER CYCLE

Group 21—Water In Plants

mortality and a decreased proportion of ovigerous to non-ovigerous females. The average brood size/ovigerous female did not decline significantly throughout the reproductive period indicating that food limitation did not induce the observed summer decline in amphipod abundance. (Steiner, Mass)
W79-03116

A COMPREHENSIVE STUDY OF SUCCESSIONAL PATTERNS OF PLANTS AND ANIMALS AT UPLAND DISPOSAL AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
For primary bibliographic entry see Field 5E.
W79-03257

FIELD MEASURED AND SIMULATED CORN LEAF WATER POTENTIAL.
Agricultural Research Service, Morris, MN.
D. C. Reicosky, and J. R. Lambert.
Soil Science Society of America Journal, Vol. 42, No. 2, p 221-228, March-April, 1978. 6 fig, 2 tab, 27 ref.

Descriptors: *Sweet corn, Simulation analysis, *Moisture content, *Moisture tension, Microenvironment, Stemflow, Leaves.

The dynamic nature and magnitude of field-measured leaf water potential for sweet corn (*Zea mays L.*) was compared with that predicted by the model TROIKA. Some plant parameters for corn were estimated from the literature and field observation, whereas the moisture desorption curve and the hydraulic conductivity-water content relationship were determined for the Varina sandy loam. Leaf water potential-relative water content relationships were determined in the greenhouse. Hourly microclimate data were used as input to the model, and the predicted and observed values of leaf water potential were compared for 3 days during the growing season. Generally, the model predicted leaf water potential with reasonable accuracy throughout the day. Water potential gradients in the soil were small as compared with those across the root and across the stomatal opening. (Skogerboe-Colorado State)
W79-03431

UPTAKE OF CADMIUM FROM PHOSPHATE FERTILIZERS BY PEAS, RADISHES, AND LETTUCE,
Corvallis Environmental Research Lab., OR.
J. O. Reuss, H. L. Dooley, and W. Griffis.
Journal of Environmental Quality, Vol. 7, No. 1, p 128-133, January-March 1978. 2 fig, 7 tab, 6 ref.

Descriptors: Heavy metals, *Phosphates, Fertilizers, *Cadmium, *Absorption, *Radishes, *Peas, *Lettuce.

Cadmium uptake from phosphate fertilizers by radish, lettuce, and garden peas was investigated in the greenhouse. Reagent grade mono-calcium phosphate and concentrated superphosphate (CSP) were used as a P source on a coarse-textured acid soil. The effect of mono-calcium phosphate compared with that of CSP on radish, lettuce and peas was nonsignificant. On a medium-textured calcareous soil the use of this CSP increased the Cd content of radish tops by about 80% and that of lettuce by 50%. The effect on radish roots from calcareous soil was nonsignificant. Pea seeds and foliage on this soil were below our Cd detection limit. Uptake on both soils was a linear function of the Cd content of the fertilizer. In the acid soil, spot placement of fertilizer in comparison to mixing it with the soil resulted essentially the same Cd uptake from CSP fertilizer. Spot placement of Di-ammonium phosphate (DAP) almost completely eliminated Cd uptake from the fertilizer. In the calcareous soil spot placement increased Cd uptake from the CSP fertilizer but slightly depressed uptake from DAP. (Skogerboe-Colorado State)
W79-03424

POTASSIUM UPTAKE BY ONION ROOTS CHARACTERIZED BY POTASSIUM/RUBIDIUM RATIO.

Purdue Univ., Lafayette, IN. Dept. of Agronomy.
V. C. Baligar, and S. A. Barber.
Soil Science Society of America Journal, Vol. 42, No. 4, p 618-622, July-August, 1978. 8 tab, 15 ref, 3 equ.

Descriptors: Cations, *Cation exchange, *Potassium, *Onions, *Sweet corn, Selectivity, Diffusivity, *Root systems.

A common belief is that plant roots absorb cations from the solution phase of the soil. Experiments with corn (*Zea mays L.*) using K/Rb ratio to evaluate the source of K and Rb absorbed indicated the plant roots absorbed these ions in the ratio of exchangeable K and Rb. The objective of this research was to study the source of K and Rb absorbed from soil by onion (*Allium cepa*) roots since they do not have root hairs and this may influence the uptake mechanism. Onions absorbed K/Rb with a ratio which was intermediate between the ratio of exchangeable K and Rb and the ratio of these cations in solution. In comparison with corn, onions absorbed K at one-third the rate, but absorbed water three times faster so that mass flow contributed a greater proportion of K absorbed by onions than by corn. This, rather than differences in root hairs may be the reason for the observed differences in K uptake between corn and onions. (Skogerboe-Colorado State)
W79-03431

2J. Erosion and Sedimentation

SIGNIFICANCE OF TURBIDITY FOR QUALITY ASSESSMENT OF AGRICULTURAL RUNOFF AND IRRIGATION RETURN FLOW,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 5A.
W79-03006

SEDIMENTOLOGY OF MEDIAL MORAINES ON BERENDON GLACIER, BRITISH COLUMBIA, CANADA: IMPLICATIONS FOR DEBRIS TRANSPORT IN A GLACIERIZED BASIN,
University of East Anglia, Norwich (England). School of Environmental Sciences.
For primary bibliographic entry see Field 2C.
W79-03052

RESPONSIVENESS OF SOIL EROSION LOSSES IN THE CORN BELT TO INCREASED DEMANDS FOR AGRICULTURAL PRODUCTS,
Arizona Univ., Tucson. Dept. of Agricultural Economics.
For primary bibliographic entry see Field 3F.
W79-03064

LOESS DEPOSITS ASSOCIATED WITH DESERTS,
Leeds Univ. (England). Dept. of Civil Engineering.
I. J. Smalley, and D. H. Krinsley.
Catena, Vol. 5, p. 53-66, 1978. 70 ref.

Descriptors: *Loess, *Sediment distribution, *Sierozems, Soil types, Silts, Wind erosion, Water erosion, *Glacial sediments, Carbonates, Clay minerals, Silicates, Sedimentary petrology, Weathering, Geomorphology, Geophysics.

Loess deposits of the world are divided by nature and distribution into warm-desert loess and cold-glacial loess. Although glacial derived loess is well known by composition and origin, understanding of desert loess has remained somewhat speculative. The purpose of this analysis is to solve some of these problems associated with the nature and formation of true desert loess deposits. Separate analysis of desert loess in China, the Mediterranean, the Middle East, and central Asia reveals that although transported from adjacent deserts, the

loess particles themselves had their origins in glacial grinding and cold weather processes in adjacent mountains. Accordingly, deserts not close to such mountainous areas, such as the Sahara and Australian deserts, are lacking in loess deposits. While some researchers have then proposed the glacial and cold weather origin of all loess, it is apparent from recent studies that the weathering of igneous rock is the origin of some desert loess. Additionally, a loess is found in the Persian-Arabian Gulf area which can be distinguished from the normal loess by its fundamental coarse silt composition of carbonate, as opposed to the post depositional carbonate accumulation of the more commonly found loess. It is pointed out, however, that despite these recent studies, the great majority of the world's loess deposits are derived from cold weather and glacial erosion. (Tiches-Arizona)
W79-03138

PLANT INDICATORS OF SLOPE INSTABILITY,
Washington State Univ., Pullman. Dept. of Forestry and Range Management.
For primary bibliographic entry see Field 4D.
W79-03285

HYDROLOGIC AND GEOMORPHIC DATA FROM THE PICEANCE BASIN, COLORADO, 1972-77,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03359

THE KINEMATICS OF BREAKING WAVES IN THE SURF ZONE,
Naval Postgraduate School, Monterey, CA.
For primary bibliographic entry see Field 2L.
W79-03379

HARVESTING EFFECTS ON SOIL AND WATER IN THE EASTERN HARDWOOD FOREST,
Northeastern Forest Experiment Station, Parsons, WV. Timber and Watershed Lab.
For primary bibliographic entry see Field 4C.
W79-03412

EFFECTS OF SEDIMENT ADDITION ON MACROBENTHIC INVERTEBRATES IN A NORTHERN CANADIAN RIVER,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W79-03470

2K. Chemical Processes

HYDROLOGIC AND CHEMICAL ANALYSES OF THE OLD TOWN AND HAMPTON, MAINE WELL FIELDS WITH REGARD TO THE HIGH IRON AND MANGANESE CONCENTRATION PROBLEM,
Maine Univ. at Orono. Dept. of Civil Engineering.
C. N. Blanchard, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 741. Price codes: A07 in paper copy, A01 in microfiche. MS Thesis, August 1978. 144 p, 18 fig, 13 tab, 35 ref, 4 append. OWR A-036-ME(1).

Descriptors: Aquifers, *Iron, *Manganese, Pumping, Recharge, *Water chemistry, *Water wells, Groundwater, *Maine, Pollutant identification, Glaciated terrains.

An investigation of the well fields belonging to the water districts of Old Town and Hampden, Maine was undertaken to understand the mechanisms that cause high concentrations of dissolved Fe and Mn in water pumped from glaciated terrains. Parameters measured in water samples from the well fields were temperature, pH, Eh, alkalinity, O₂, CO₂, HCO₃, sigma Fe, sigma Mn, Ca, Na, Mg, K,

WATER CYCLE—Field 2

Chemical Processes—Group 2K

Cl, SO₄, and H₄SiO₄ concentrations. Chemical data indicated that the Old Town and Hampden aquifers (eakers) have considerable recharge from the Stillwater River and the Souadabasook Stream, respectively. Water pumped from production wells was a mixture of 'young' (contains dissolved O₂) and 'old' (O₂ depleted, generally deeper, and having been in contact with aquifer material and bedrock for a longer period of time) water. The proportion of young to old water pumped appeared to determine the concentrations of dissolved Fe and Mn. This ratio was influenced by pumping rate, well depth and screen length, location and type of recharge (river and/or precipitation), and the aquifer material.

W79-03038

AN AUTOMATED DETERMINATION OF LOW REACTIVE PHOSPHORUS CONCENTRATIONS IN NATURAL WATERS IN THE PRESENCE OF ARSENIC, SILICON AND MERCURIC CHLORIDE,
Department of Scientific and Industrial Research, Taupo (New Zealand), Ecology Div.
For primary bibliographic entry see Field 5A.

W79-03047

CHEMICAL COMPOSITION OF ACID PRECIPITATION IN PASADENA, CALIF.,
California Inst. of Tech., Pasadena. Dept. of Environmental Engineering Science.
For primary bibliographic entry see Field 5A.

W79-03054

RECENT DEVELOPMENTS IN ATMOSPHERIC CHEMISTRY,
Cambridge Univ. (England). Dept. of Physical Chemistry.
B. A. Thrush.

Nature, Vol 276, No 5686, (Climatology Supplement), p 345-348, November 23, 1978. 3 fig, 19 ref.

Descriptors: *Atmosphere, *Chemistry, *Chemical properties, Air pollution, Air pollution effects, Chemical reactions, Ozone, Oxygen, Oxides, Hydrogen compounds, Chemicals, Ultraviolet radiation, Carbon dioxide, Weather, Meteorology, Tropospheric chemistry, Stratospheric chemistry, Atmospheric chemistry, Carbon monoxide.

The chemistry of the atmosphere was a largely neglected topic until the last decade, during which concern about pollution has produced a flurry of activity. The processes which may deplete the relatively small amount of ozone in the stratosphere which protects us from harmful UV light have much in common with those in the Los Angeles-type smog which generate ozone and other oxidants. Such systems involve chain reactions in which free radicals such as HO, HO₂ and ClO can carry out a chemical conversion process (ozone to oxygen) many times before they are destroyed. Recent research showed that nitrogen oxides from the exhausts of supersonic aircraft or derived from increased use of nitrogenous fertilisers will have little effect on stratospheric ozone, but the potential effects of chlorine compounds, such as aerosol propellants, require careful examination. In contrast, the oxidation of carbon monoxide is now thought to be a major source of ozone in the lower atmosphere. (Sims-ISWS)

W79-03072

DONNAN DIALYSIS MATRIX NORMALIZATION FOR CATHODIC STRIPPING VOLTAMMETRY,
Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry.
For primary bibliographic entry see Field 5A.

W79-03103

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER,
Department of Scientific and Industrial Research Taupo (New Zealand). Freshwater Section.

For primary bibliographic entry see Field 5A.
W79-03181

PERFORMANCE EVALUATION OF GUILDFLINE MODEL 3400 LABORATORY SALINOMETER,

National Oceanographic Instrumentation Center, Washington, DC.

For primary bibliographic entry see Field 7B.
W79-03270

A HYDROLOGIC STUDY OF WATER WELL YIELDS AND GROUNDWATER QUALITY RELATED TO STRATIGRAPHIC AND STRUCTURAL SETTINGS IN WESTERN JACKSON COUNTY, WEST VIRGINIA,

West Virginia Univ., Morgantown. Dept. of Geology and Geography.

For primary bibliographic entry see Field 5A.
W79-03306

WARM SPRINGS, SOUTH ISLAND, NEW ZEALAND, AND THEIR POTENTIALS TO YIELD LAUMONTITE,

Geological Survey, Menlo Park, CA. Water Resources Div.; and Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.

I. Barnes, C. J. Downes, and J. R. Hulston. American Journal of Science, Vol. 278, p. 1412-1427, December 1978. 2 fig, 5 tab.

Descriptors: *Thermal springs, *Chemical reactions, *Geochemistry, *Zeolites, *Carbon dioxide, Meteoric water, Ionization, Calcite, Water sampling, Analytical techniques, Chemical analysis, Geology, Metamorphic rocks, *New Zealand, Laumontite.

Warm springs (40 to 65°C) of South Island, New Zealand, are all supersaturated with laumontite and with few exceptions are either in equilibrium with or are unsaturated with calcite and albite. Two gels with essential cation-oxygen-silicon ionic link were found as reaction products. The waters are meteoric in origin. From isotopic compositions, dissolved CO₂ species are in part from oxidation of organic material and in part from the solution of calcite. The CO₂ partial pressure range from an exceptionally low value of 0.0000053 atm. to an exceptionally high value of 0.87 atm. The CO₂ partial pressures are dependent variables and do not control the chemical reactions. Analcime should not be regarded necessarily as a lower grade metamorphic facies indicator nor should prehnite necessarily be regarded as a higher grade metamorphic product. Rather, they may be products of different chemical rather than physical conditions. (Woodard-USGS)

W79-03340

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE SANDSTONE AQUIFER, WISCONSIN,

Geological Survey, Madison, WI. Water Resources Div.

For primary bibliographic entry see Field 7C.
W79-03341

PREDICTED WATER-LEVEL AND WATER-QUALITY EFFECTS OF ARTIFICIAL RECHARGE IN THE UPPER COACHELLA VALLEY, CALIFORNIA, USING A FINITE-ELEMENT DIGITAL MODEL,

Geological Survey, Menlo Park CA. Water Resources Div.

For primary bibliographic entry see Field 4B.
W79-03346

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, FEBRUARY 1975 - SEPTEMBER 1977,

Geological Survey, San Antonio, TX. Water Resources Div.

For primary bibliographic entry see Field 5A.

W79-03353

RELATIONSHIP TO EXTRACTABLE SOIL MANGANESE TO SOIL PROPERTIES,

Georgia Univ., Experiment. Dept. of Agronomy.

For primary bibliographic entry see Field 2G.

W79-03360

POSSIBLE ERRORS CAUSED PRIOR TO MEASUREMENT OF MERCURY IN NATURAL WATERS WITH SPECIAL REFERENCE TO SEAWATER,

Hokkaido Univ., Hakodate (Japan). Dept. of Chemistry.

For primary bibliographic entry see Field 5A.
W79-03368

MICROBIAL ASPECTS OF THE VOLATILE LOSS OF APPLIED MERCURY (II) FROM SOILS,

Oregon State Univ., Corvallis. Dept. of Soil Science; and Oregon State Univ., Corvallis. Dept. of Agriculture Chemistry.

E. R. Landa.

Journal of Environmental Quality, Vol. 7, No. 1, p. 84-86, January-March, 1978. 1 fig, 1 tab, 21 ref.

Descriptors: Autoclaves, *Mercury, *Volatility, *Microbial degradation, Soil amendments, *Montana.

Five surface soils from southeastern Montana were studied to determine the effects of autoclaving and glucose additions on the volatile loss of applied divalent inorganic mercury. Soils were amended to 1 ppm Hg as 203 Hg - Hg(NO₃)₂, maintained at room temperature near the 1/3-bar moisture content, and Hg content monitored for 7 weeks. Mercury losses from soils receiving neither autoclaving or glucose additions ranged from 5 to 30%. In general, autoclaving reduced the total quantity of Hg lost, while glucose additions increased the initial loss rate of applied Hg. (Skogerboe-Colorado State)

W79-03419

PHOSPHATE ADSORPTION-DESORPTION CHARACTERISTICS OF SOILS AND BOTTOM SEDIMENTS IN THE MAUMEE RIVER BASIN OF OHIO,

Texas A and M Univ., College Station, Dept. of Agronomy.

D. L. McCallister, and T. J. Logan.

Journal of Environmental Quality, Vol. 7, No. 1, p. 87-92, January-March, 1978. 2 fig, 6 tab, 27 ref.

Descriptors: *Adsorption, Eutrophication, Pollutants, *Phosphates, Runoff, Isotherms, *Desorption, Soils, Bottom sediments, *Ohio, *Maumee River basin(Ohio).

Langmuir adsorption isotherms showed that Maumee River Basin sediments had adsorption capacities 10 to 20 times greater than Basin soils. Although the soil clay fractions had adsorption capacities higher than the whole soil, they were considerably less than those of the sediments and the difference is attributed to the higher content of amorphous or low-range order iron and aluminum components in the bottom sediments. Equilibrium phosphorus concentration (EPC) and phosphorus desorbed was similar for soil and sediments as well as total P, indicating that although the bottom sediments have a high capacity to adsorb P, this capacity has not been realized. Correlations between adsorption-desorption parameters and soil/sediment properties are presented. Bray P1 'available' P was highly correlated with EPC and P desorbed in the soils but to a lesser extent in the bottom sediments. CDB and oxalate extractable-P was highly correlated with P adsorption capacity in the bottom sediments but not in the soils. (Skogerboe-Colorado State)

W79-03421

THE MECHANISM OF SULFATE ADSORPTION ON IRON OXIDES,

Field 2—WATER CYCLE

Group 2K—Chemical Processes

Griffith Univ., Nathan (Australia). School of Science.

R. L. Parfitt, and R. St. C. Smart.

Soil Science Society of America Journal, Vol. 42, No. 1, p 48-50, January-February, 1978. 5 fig, 2 tab, 17 ref.

Descriptors: *Sulfates, *Adsorption, *Iron oxides, Isotherms, Spectroscopy, Structural models, Soil chemistry.

Adsorption isotherms were determined for sulfate adsorption on iron oxides under acid conditions. The product of the surface reaction between the iron oxides and sulfate ions was examined by infrared spectroscopy which showed four bands in the Nu S-O stretching region. Thus a structural model could be obtained for the reaction. Two surface hydroxyl groups (or OH₂(+) ions) are replaced by one sulfate ion, and two oxygen atoms of the sulfate ion are coordinated each to a different Fe(3+) ion, resulting in the binuclear bridging surface complex Fe-O-S(O₂)₂-Fe. The complex is formed on the surfaces of goethite (alpha-FeOOH), akaganeite (beta-FeOOH), lepidocrocite (gamma-FeOOH), hematite (alpha-Fe₂O₃) and amorphous ferric hydroxide. (Skogerbæe-Carlsbad State) W79-03428

THE ACETYLENE INHIBITION METHOD FOR SHORT-TERM MEASUREMENT OF SOIL DENITRIFICATION AND ITS EVALUATION USING NITROGEN-13, Michigan State Univ., East Lansing. Dept. of Crop and Soil Sciences.

M. S. Smith, M. K. Firestone, and J. M. Tiedje. Soil Science Society of America Journal, Vol. 42, No. 4, p 611-615, July-August, 1978. 1 fig, 6 tab, 11 ref.

Descriptors: *Denitrification, Inhibitors, *Nitrogen-13, Reduction(Chemical), Anaerobic conditions, Aerobic treatment, Soil treatment.

Acetylene was found to effectively inhibit the reduction of N₂O by anaerobic soils. With concentrations of C₂H₂ above 0.1 atm, added NO₃(-) was quantitatively converted to N₂O and added N₂O was reduced at an insignificant rate. Experiments with ¹³N demonstrated that at low soil nitrate concentrations at least 0.1 atm C₂H₂ was required for effective inhibition. Denitrification rates determined by ¹³N and by C₂H₂ inhibition methods correlated well, as did determination of N₂O/(N₂ + N₂O). The methods also revealed that an acceleration in denitrification rate occurred within a few hours after soil was exposed to anaerobic conditions. The acetylene method was generally used to measure denitrification rates in soils incubated as anaerobic slurries, but was also used to determine rates for field moist aggregates incubated anaerobically and aerobically. When assayed as anaerobic slurries, initial denitrification rates ranged from 0.1 to 0.7 m moles N gas/soil/min for the mineral soils examined. The denitrification rate in aerobic aggregates was approximately 1,000 times less, showing the strong inhibitory effect of O₂ on the indigenous denitrifying enzymes. (Skogerbæe-Carlsbad State) W79-03429

SYSTEM FOR ANALYSIS OF ORGANIC POLLUTANTS IN WATER, La Trobe Univ., Bundoora (Australia). Dept. of Physical Chemistry.

For primary bibliographic entry see Field 5A. W79-03430

DETERMINING SOIL GYPSUM CONTENT AND EXPRESSING PROPERTIES OF GYPSIFEROUS SOILS, National Soil Survey Lab., Lincoln, NE.

For primary bibliographic entry see Field 2G. W79-03491

2L. Estuaries

EFFECTS OF MOSQUITO CONTROL DITCHING ON JUNCUS MARSHES AND UTILIZATION OF MOSQUITO CONTROL DITCHES BY ESTUARINE FISHES AND INVERTEBRATES, North Carolina Univ. at Chapel Hill. Inst. of Marine Sciences.

For primary bibliographic entry see Field 5G. W79-03023

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS, Texas Water Development Board, Austin. For primary bibliographic entry see Field 6G. W79-03043

HYDROLOGY OF SMALL OCEANIC ISLANDS - INFLUENCE OF ATMOSPHERIC PRESSURE ON THE WATER TABLE, Washington State Univ., Pullman. Dept. of Geology.

J. L. Vacher. Ground Water, Vol 16, No 6, p 417-423, November-December 1978. 8 fig, 12 ref.

Descriptors: *Islands, *Atmospheric pressure, *Water table, *Model studies, Hydrology, Recharge, Sea level, Ocean waves, Rainfall, Effects, *Oceanic islands, *Sea-level fluctuations, Permeable oceanic island, Ocean fronts, Astronomical tides, Inverted barometer effect, Pressure-related fluctuations.

There is a spectrum of sea level fluctuations that affects the water table of small, permeable islands. At the high-frequency end of the spectrum are the semi-diurnal and diurnal components of the astronomical tides. Also affecting sea level elevation are atmospheric pressure and the temperature and salinity (hence density) of the ocean column. Changes in atmospheric pressure cause sea level changes on the order of up to about 30 cm by what oceanographers call the 'inverted barometer effect'. As a result, pressure changes, like tides, generate waves that migrate across the water table. Amplitudes of the resultant pressure-related water table fluctuations diminish inland. However, owing to the relatively long period of the pressure-related fluctuations, their inland attenuation is far less than that of the hydraulically analogous tides. In fact, in Bermuda for example, the pressure-related water table fluctuations completely dominate water table statistics that reflect day-to-day changes in elevation. Because a drop in pressure and corresponding rise in the water table accompany passage of a storm front, which also bring a rainfall, there commonly is a coincidental, and very misleading, correlation between rainfalls and water table rises. In island and coastal settings, non-tidal sea level changes and their effect on the water table must be considered if recharge is to be evaluated correctly from water table data. (Roberts-ISWS) W79-03056

WAVE DAMPENING DUE TO RUBBLE-MOUND BREAKWATERS, British Columbia Univ., Vancouver. Dept. of Civil Engineering. For primary bibliographic entry see Field 8B. W79-03059

WAVE FORCES ON PIPELINE BURIED IN PERMEABLE SEABED, New South Wales Univ., Kensington (Australia). Dept. of Theoretical and Applied Mechanics. For primary bibliographic entry see Field 8B. W79-03060

LABORATORY EXPERIMENTS WITH SOLITARY WAVE, Technion - Israel Inst. of Tech., Haifa. Coastal and Marine Engineering Research Inst.

For primary bibliographic entry see Field 8B. W79-03061

TEMPORAL VARIATIONS AND PROBABLE ORIGINS OF HYDROCARBONS IN THE WATER COLUMN OF BEDFORD BASIN, NOVA SCOTIA, Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab.

D. C. Gordon, P. D. Keizer, and J. Dale. Estuarine and Coastal Marine Science, Vol 7, No 3, p 243-256, September 1978. 8 fig, 4 tab, 28 ref.

Descriptors: *Organic compounds, *Canada, *Marine biology, *Water properties, *Estuaries, Bays, Sea water, Phytoplankton, Primary production, Chlorophyll, Temporal distribution, Chemicals, Chemical analysis, Analytical techniques, *Pollutant identification, *Biosynthesis, *Bedford Basin(Nova Scotia).

Hydrocarbons in Bedford Basin seawater were analyzed on 33 dates between January 1975 and April 1976 by fluorescence spectroscopy and gas chromatography. Crude oil equivalent concentrations averaged 2.5 and 1.8 microgram/l at 2 and 50 m, respectively, while total n-alkanes averaged 200 and 180 ng/l at the same depths. Crude oil equivalent concentrations were slightly higher than generally found in oceanic regions, while total n-alkane concentrations were comparable. Hydrocarbon concentrations tended to be highest in the winter and lowest in the summer. Biosynthesis does not appear to be an important source of hydrocarbons since the concentration of only one hydrocarbon (retention index of 2052 and suspected to be a polyunsaturated olefin reported to be common in marine phytoplankton) increased during the spring phytoplankton bloom. The majority of hydrocarbons appear to be of anthropogenic origin, and the increased use of fuel oils in the urban area surrounding Bedford Basin during the colder months can explain the higher winter-time concentrations. If biosynthesis is not an important hydrocarbon source in Bedford Basin, it can be argued that it is also unimportant in the ocean as a whole. (Sims-ISWS) W79-03062

SHOREFACE-CONNECTED SAND RIDGES ON AMERICAN AND EUROPEAN SHELVES: A COMPARISON, National Oceanic and Atmospheric Administration, Miami, FL. Atlantic Oceanographic and Meteorological Lab. D. J. P. Swift, G. Parker, N. W. Lanfredi, G. Peillo, and K. Figge. Estuarine and Coastal Marine Science, Vol 7, No 3, p 257-273, September 1978. 14 fig, 33 ref.

Descriptors: *Sand waves, *Topography, *Continental shelf, *North America, *South America, *Europe, *Atlantic Ocean, Erosion, Sedimentation, Sediments, Coasts, Shores, Currents(Water), Ocean currents, Circulation, Water circulation, Oceanography, Shoresfaces, Bedforms, Sand ridges.

Large-scale sand ridges, 10 m or more in height and 2-4 km apart, have long been accepted as characteristic of shelves experiencing strong tidal flow. However, they also occur on inner continental shelves whose strongest flows are wind-induced. The Middle Atlantic Bight of North America is the best known example, but inner shelf ridge topographies occur extensively on other Atlantic shelves. This paper discussed similarities and differences among the inner shelf ridges of North America, South America, and Europe as a necessary step prior to the framing and testing of hypotheses concerning the hydrodynamics of ridge formation. Inner shelf ridges characteristically are aligned obliquely to the shoreline, with acute angles opening into the prevailing flow direction. Downcurrent slopes tend to be steeper and finer grained. The ridges tend to migrate downcoast and offshore, extending their crestlines so as to maintain contact with the shoreface. Where ridges are nearly shore-parallel (current parallel), the movement is expressed as downcurrent growth of ridges and downcurrent extension of swales between

ridges. Ridge behavior, and especially ridge migration rates, are necessary information for marine environmental management, since ridges are most active in the nearshore zone where the shelf floor is used for sewage outfalls, deepwater ports, nuclear reactor sites, and other structures requiring a measure of sea floor stability. (Sims-ISWS)
W79-03063

ACTINIDE ACTIVITIES IN WATER ENTERING THE NORTHERN NORTH SEA,
Deutsches Hydrographisches Inst., Hamburg (Germany, F.R.) Lab. Süldorf.
For primary bibliographic entry see Field 5A.
W79-03067

MEASUREMENT OF OCEAN WAVE HEIGHTS USING THE GEOS 3 ALTIMETER,
National Oceanic and Atmospheric Administration, Boulder, CO. Wave Propagation Lab.
For primary bibliographic entry see Field 7B.
W79-03076

OCEANOGRAPHIC CONDITIONS IN LOWER COOK INLET: SPRING AND SUMMER 1973,
National Oceanic and Atmospheric Administration, Seattle, WA. Pacific Marine Environmental Lab.

R. D. Muench, H. O. Mofield, and R. L. Charnell, Journal of Geophysical Research, Vol 83, No C10, p 5090-5098, October 20, 1978. 8 fig, 1 tab, 17 ref.

Descriptors: *Estuaries, *Tidal waters, *On-site data collections, *Alaska, Currents(Water), Salinity, Temperature, Water temperature, Density, Sampling, On-site investigations, Current meters, Water sampling, Tidal effects, Circulation, Water circulation, Oceanography, *Cook Inlet(AK).

Current, salinity, and temperature data obtained from lower Cook Inlet during May-September 1973 have been analyzed. These data define a regional mean circulation whose main features are: (1) a concentrated southward flow along the western shore of lower Cook Inlet of water from upper Cook Inlet which has been diluted by river input, (2) an intense westerly flow across the lower inlet which originates from Kennedy Entrance, exits via Shelikoff Strait, and is bathymetrically steered in a cyclonic sense during its transit across the inlet, and (3) a slow northward drift in eastern lower Cook Inlet. The southward flow is an estuarine mode due to freshwater input to upper Cook Inlet. The westerly flow is driven by the westward flowing Alaska Current. The weak northward drift replaces water which has been entrained into the south flowing current. Large tidal and wind-induced currents are superposed on this mean flow and contribute to complex temperature and salinity distributions. The circulation scheme as redefined here allows for vertical motions and has important consequences in relation to high regional biological productivity and fates of contaminants. (Sims-ISWS)
W79-03077

MASS TRANSPORT IN A COASTAL CHANNEL, MARCO RIVER, FLORIDA,
Rosenstiel School of Marine and Atmospheric Science, Miami, FL.
J. van de Kreeke.
Estuarine and Coastal Marine Science, Vol 7, No 3, p 203-214, September 1978. 6 fig, 3 tab, 7 ref.
NSF EGN76-08288.

Descriptors: *Tidal waters, *Mass transfer, *Channels, *Florida, On-site investigations, On-site data collections, Model studies, Mathematical models, Theoretical analysis, Wetlands, Coasts, Flow, Tides, Tidal effects, Salts, Salinity, Estuaries, *Coastal channels, *Marco River(FL).

It follows from measurements that advection is the dominant mode of transport in the Marco River. Typical values for the tidally averaged salt and water flux were respectively, 400 kg/s and 20 cu m/s. An analysis of the dynamics of the flow showed that the longitudinal flux of water is asso-

ciated with the tidal stress, the tidally averaged bottom stress, the spatial variation of the mean water level, and the cross-sectionally averaged salinity. An approximate analytic expression was derived to illustrate the independent effects of the differences in tidal amplitude, phase, mean water level, and density at the open boundaries on the net flux of water. Using a finite difference technique, the magnitude of the tidally averaged water flux and its components associated with the Eulerian mean velocity and Stokes Drift velocity were computed for two schematizations of the Marco River. Computed and measured quantities were in fair agreement. (Sims-ISWS)
W79-03078

A RECORD OF THE ACCUMULATION OF SEDIMENT AND TRACE METALS IN A CONNECTICUT, U.S.A., SALT MARSH,
Yale Univ., New Haven, CT.

For primary bibliographic entry see Field 5B.
W79-03113

NUMERICAL TECHNIQUES FOR ESTIMATING BEST-DISTRIBUTED MANNING'S ROUGHNESS COEFFICIENTS FOR OPEN ESTUARIAL RIVER SYSTEMS,

Rutgers - The State Univ., Piscataway, NJ. Dept. of Chemical and Biochemical Engineering.
B. Davidson, R. Vichnevetsky, and H. T. Wang, Water Resources Research, Vol. 14, No. 5, October 1978, p 777-789. 10 figs, 1 tab, 65 refs. A-45-NJ. (3) 14-34-0001-7064.

Descriptors: Estuaries, Friction, *Manning's equation, Roughness, Estimation, Reynolds number, Hydraulic models, *Delaware River estuary, Model studies, Simulation analysis.

A finite difference version of the Levenberg-Marquardt method for nonlinear least squares problems has been extended to include inverse problems in distributed estuarial hydraulic systems. The objective in solving the inverse problems was to establish a numerical simulation procedure for estimating best-distributed Manning's roughness coefficients from sets of observed tide heights. As an illustration, spatially varying Manning's roughness coefficients for the Upper Delaware River Estuary system were determined for several representative sets of tide height data for the period October 1973 to June 1974. The roughness coefficients were modeled as polynomial functions of distance. Manning's n was thus found generally to vary inversely with distance from the head of tide at Trenton to Wilmington. The spatially distributed tidal-averaged Reynolds number Re was used to correlate Manning's n and Darcy-Weisbach's f . The resultant $n-Re$ relationships displayed three distinct hydrodynamic flow regimes characterized as having turbulence. Both n and f were found to be independent of Re for $Re < 1.52 \times 10^6$ but inversely related to Re for $Re > 1.2 \times 10^6$. Among the numerical techniques used to simulate tidal hydraulic transients it was found that a 'hoppershot' finite difference method yielded the best compromise between computational economy and overall accuracy.
W79-03115

FACTORS REGULATING THE DISTRIBUTION AND POPULATION DYNAMICS OF THE AMPHIPOD GAMMARUS PALUSTRIS IN AN INTERTIDAL SALT MARSH COMMUNITY,

Maryland Univ., College Park. Dept. of Zoology. For primary bibliographic entry see Field 21.
W79-03116

ON NUTRIENTS AND THEIR ROLE AS PRODUCTION LIMITING FACTORS IN THE BALISTIC,

Fishery Board of Sweden, Goteborg. Inst. of Marine Research.
For primary bibliographic entry see Field 5C.
W79-03182

BOUYANT SURFACE JET IN TIDAL LONG-SHORE CURRENT,
New South Wales Univ., Kensington (Australia). School of Mathematics.
For primary bibliographic entry see Field 8B.
W79-03288

ON THE NUMERICAL MODELLING OF SHORT WAVES IN SHALLOW WATER,
International Inst. for Hydraulic and Environmental Engineering, Delft (The Netherlands).

For primary bibliographic entry see Field 8B.
W79-03292

ENERGY FLUX AND WAVE ACTION IN GRAVITY WAVES PROPAGATING ON A CURRENT,

Technical Univ. of Denmark, Lyngby. Inst. of Hydromechanics and Hydraulic Engineering.
For primary bibliographic entry see Field 8B.
W79-03294

THE DAMPING OF SOLITARY WAVES,
Coastal and Marine Engineering Research Inst. Haifa (Israel).

For primary bibliographic entry see Field 8B.
W79-03295

LITTORAL DRIFT AND EROSION AT BELLE PASS, LOUISIANA,

Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.

E. J. Dantin, C. A. Whitehurst, and W. T. Durbin, Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol. 104, No. WW4, Proceedings Paper 14184, p 375-390, November 1978. 17 fig, 2 tab, 15 ref.

Descriptors: *Louisiana, *Beach erosion, *Beaches, *Model studies, Coastal engineering, Hydraulic models, Littoral drift, Sediment transport, Shore protection, *Jetties, Tidal flow.

Channel enlargement and modifications to the jetties at Belle Pass, the mouth of Bayou Lafourche on the Gulf coast of Louisiana, had become necessary due to increased marine traffic by offshore oil and mining production and the fishing industry, along with the proposed development of nearby Port Fourchon. Permission for construction, required by the Corps of Engineers, was granted after map and aerial photo studies, field observations, and hydraulic model experiments showed that beach erosion, and especially littoral bypassing, would be affected insignificantly by extension to the existing single jetty and construction of a new twin jetty. The average annual recession rate of the coastline in the Belle Pass area between 1885 and 1932 was 79 ft/yr (24m/yr). After construction of the first jetties in 1940, this rate gradually decreased to 25 ft/yr (8 m/yr) by 1974. Most littoral material bypasses the jetties due to inefficient orientation to the present shore line. Field tracking of subsurface floats provided data to calibrate a small, distorted-scale model. (Lee-ISWS)
W79-03299

POSITIVE FLOW ESTUARY STRUCTURE,
Poseidon Marketing and Development Co., Arcadia, CA. (Assignee).
For primary bibliographic entry see Field 8B.
W79-03318

GROUND-WATER RESOURCES OF THE CAPE LOOKOUT NATIONAL SEASHORE, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.

M. D. Winner, Jr.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 499. Price codes: A03 in paper copy, A01 in microfiche. Water-Resources Investigations 78-52, June 1978. 49 p, 26 fig, 2 tab, 6 ref.

Field 2—WATER CYCLE

Group 2L—Estuaries

Descriptors: *Groundwater resources, Hydrology, *Aquifer characteristics, *Saline water intrusion, *National seashores, *North Carolina, Water quality, Water yield, Saline water-freshwater interfaces, *Cape Lookout National Seashore(NC).

Fresh groundwater in the Cape Lookout National Seashore in North Carolina occurs in the unconfined aquifer, an upper confined aquifer, and a lower limestone aquifer. The unconfined aquifer beneath dunes on the barrier islands is estimated to yield as much as 30 gallons per minute of freshwater to a horizontal well, but this aquifer is subject to periodic overwash by the ocean, thus temporarily contaminating the aquifer with saltwater. The upper confined aquifer is about 90 to 150 feet deep, but is known to contain freshwater only in the Drum Inlet area. The potential yield of this aquifer where it is fresh is unknown because of the possibility of saltwater encroachment. The lower limestone aquifer (150 to 550 feet deep) contains freshwater southeast of Drum Inlet; potential yields is estimated to be as great as 500 gallons per minute per well. The estimated yields from all aquifers depend on the position of the saltwater interface at any given site. Maps of the Seashore show areas where freshwater may occur in the unconfined aquifer; each map is accompanied by a description of the availability of freshwater. (Woodard-USGS) W79-03337

ENVIRONMENTAL ASPECTS OF A WELL BLOWOUT IN THE GULF OF MEXICO, Texas A and M Univ., College Station. Dept. of Oceanography. For primary bibliographic entry see Field 5C. W79-03362

APPLICATION OF THE ROTATED DISK ELECTRODE TO MEASUREMENT OF COPPER COMPLEX DISSOCIATION RATE CONSTANTS IN MARINE COASTAL SAMPLES, North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering. For primary bibliographic entry see Field 5A. W79-03365

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEZ, ALASKA, Alaska Univ., Fairbanks. Inst. of Marine Science. For primary bibliographic entry see Field 5C. W79-03366

POSSIBLE ERRORS CAUSED PRIOR TO MEASUREMENT OF MERCURY IN NATURAL WATERS WITH SPECIAL REFERENCE TO SEAWATER, Hokkaido Univ., Hakodate (Japan). Dept. of Chemistry. For primary bibliographic entry see Field 5A. W79-03368

DISTRIBUTION OF POLYCHLORINATED BI-PHENYLS (PCB) IN ESTUARINE ECOSYSTEMS. TESTING THE CONCEPT OF EQUILIBRIUM PARTITIONING IN THE MARINE ENVIRONMENT, URS Co., Seattle, WA.

For primary bibliographic entry see Field 5B. W79-03369

MEASUREMENT OF CU AND ZN IN SAN DIEGO BAY BY AUTOMATED ANODIC STRIPPING VOLTAMMETRY, Naval Ocean Systems Center, San Diego, CA. For primary bibliographic entry see Field 5A. W79-03370

LIGHT HYDROCARBONS IN RECENT TEXAS CONTINENTAL SHELF AND SLOPE SEDIMENTS, Texas A and M Univ., College Station. Dept. of Oceanography.

For primary bibliographic entry see Field 5B. W79-03371

SYSTEMS ASPECT OF OCEAN THERMAL ENERGY CONVERSION, TRW Systems and Energy, Redondo Beach, CA. For primary bibliographic entry see Field 8C. W79-03375

AN EVALUATION OF OIL AND GREASE CONTAMINATION ASSOCIATED WITH DREDGED MATERIAL CONTAINMENT AREAS, Engineering-Science, Inc./Texas, Austin. For primary bibliographic entry see Field 5B. W79-03377

FIELD INVESTIGATIONS OF CONVERGENCES AND SLICK CONCENTRATION MECHANISMS IN DELAWARE BAY. RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY, Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 5B. W79-03378

THE KINEMATICS OF BREAKING WAVES IN THE SURF ZONE, Naval Postgraduate School, Monterey, CA. A. J. Olsen.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 723, Price codes: A05 in paper copy, A01 in microfiche. Naval Postgraduate School Master's Thesis, September 1977. 68 p, 13 fig, 3 tab, 5 append.

Descriptors: *Rip currents, *Surf, *Waves, Environmental effects, Beaches, *Outer Continental Shelf, *Nearshore processes, Onshore effects, Kinematics.

Simultaneous measurements of sea surface elevation and onshore and alongshore water particle velocities were measured at three locations within the surf zone using two capacitance type penetrating wave staffs and three tow-component electromagnetic flow meters. The probability density functions, pdf, for the sea surface elevation were always highly positively skewed, whereas the pdf's for the velocities were both negatively and positively skewed. Mean values of the onshore and alongshore components of flow reflected the influence of a rip current frequently observed just south of the instrument location. Strong harmonics in the spectra of sea surface fluctuations and particle velocities infer nonlinear conditions. Coherence values between waves and onshore flow were high, ranging above 0.9. The coherence between waves and onshore flow was used to separate the turbulence and wave-induced velocity components. Over the range of collapsing to spilling breakers a reasonable value for the ratio of turbulent to wave-induced velocity was determined to be approximately 0.75. Saturation regions were found in the wave and velocity energy-density spectra at higher frequencies as evidenced by -3 and -3 slopes, respectively. (Sinha-OEIS) W79-03379

THE NORTH CAROLINA COASTAL ZONE AND ITS ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES, AND OFF-SHORE WATERS, VOLUME I, Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.

For primary bibliographic entry see Field 10C. W79-03380

THE NORTH CAROLINA COASTAL ZONE AND ITS ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES, AND OFF-SHORE WATERS. VOLUME II, Du Pont de Nemours (E. I.) and Co., Aiken, SC.

Savannah River Lab.

For primary bibliographic entry see Field 10C. W79-03381

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT, Coastal Engineering Research Center, Fort Belvoir, VA. For primary bibliographic entry see Field 5B. W79-03382

A STUDY OF NITRIFICATION IN THE DELAWARE RIVER ESTUARY, Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science. For primary bibliographic entry see Field 5B. W79-03439

COEXISTENCE OF TOXIC AND NONTOXIC DINOFLAGELLATES RESEMBLING GONYAULAX TAMARENSIS IN NEW ENGLAND COASTAL WATERS (NW ATLANTIC), Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.

For primary bibliographic entry see Field 5C. W79-03444

TOXICITY IN RESTING CYSTS OF THE RED-TIDE DINOFAGELLATE GONYAULAX EXCAVATA FROM DEEPER WATER COASTAL SEDIMENTS, Oslo Univ. (Norway). Dept. of Marine Biology and Limnology. For primary bibliographic entry see Field 5C. W79-03447

SEEVOGEL ALS INDIKATOREN FÜR ZEITLICH UND ORTLICH BEGRENZTE MEERESVERSCHMUTZUNG IM GEBIET VON HELGOLAND (DEUTSCHE BUCHT) (SEA BIRDS AS INDICATORS OF ACCIDENTAL MARINE POLLUTION IN THE HELGOLAND AREA, GERMAN BIGHT), Institute fuer Vogelforschung, Helgoland (Germany, F.R.) Instelstation. For primary bibliographic entry see Field 5C. W79-03457

THE OXIDATION OF PETROLEUM HYDROCARBONS BY MARINE BACTERIA, State Oceanographic Inst., Moscow (USSR). For primary bibliographic entry see Field 5C. W79-03480

SOME ASPECTS OF THE BIOLOGY AND HEAVY METAL ACCUMULATION OF THE FISH LIPARIS LIPARIS IN THE SEVERN ESTUARY, Bath Univ. (England). School of Biological Sciences. For primary bibliographic entry see Field 5C. W79-03497

3. WATER SUPPLY AUGMENTATION AND CONSERVATION

3A. Saline Water Conversion

HYDRODYNAMICS OF HOLLOW FIBER REVERSE OSMOSIS MODULES, Monsanto Research Corp., Dayton, OH. J. J. Hermans. Membrane Digest, Vol 1, No 3, p 45-62, Fall, 1972. 3 fig. 14-30-2773.

Descriptors: *Hydrodynamics, *Flow measurement, *Flow profiles, Desalination, Mathematics, Equations, Theoretical analysis, Membrane processes, Reverse osmosis, Desalination apparatus, Membranes, Flow characteristics.

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Water Yield Improvement—Group 3B

The theoretical relationships describing hollow fiber desalination units are developed in two parts: axial flow and radial flow. The assumptions required in developing the differential equations for each flow regime are examined, and mathematical details for both axial flow and radial flow are presented. (Davison-IPA)
W79-03024

POLARIZATION AT MEMBRANE-SOLUTION INTERFACES IN REVERSE OSMOSIS (HYPERFILTRATION)

California Univ., Berkeley Coll. of Engineering, C. P. Minning, and K. S. Spiegler.
In: Charged Gels and Membranes I, p 277-298, 1976. Eric Selegny (ed.), D. Reidel Publication Co., Dordrecht-Holland. (California Water Resources Center Desalination Project). S-175.

Descriptors: *Reverse osmosis, *Electrodialysis, Desalination processes, *Hyperfiltration, Membrane processes, *Polarization.

The study of electrical potential differences between electrolyte solutions separated by desalination membranes has led to the conclusion that not only ion-exchange membranes used in electrodialysis but also modified cellulose acetate membranes, used in reverse osmosis, often contain fixed charges. Systematic variation of the concentrations, flow rates, and pressures of sodium chloride solutions flowing past the inner surface of a cylindrical modified cellulose acetate membrane (cured at 94 degrees C, nominal diameter 1 inch = 2.54 cm) led to estimates of the interfacial salt concentration buildup and showed that streaming potentials of 6.2 to 8.0 mV/100 psi (0.91-1.17 mV atm⁻¹) were obtained for 0.5 M (29225 ppm) and 0.1 M (5845 ppm) sodium chloride solutions respectively. The polarity indicated a fixed negative charge. (Snyder-Calif Davis)
W79-03129

YUMA DESALTING TEST FACILITY,

Bureau of Reclamation, Boulder City, NV. Lower Colorado Region.
K. M. Trompeter.
Arizona Professional Engineer, Vol. 30, No. 7, p. 4-5, July, 1978. 3 fig.

Descriptors: *Desalination plants, *Water treatment, *Saline water, *Testing procedures, Mexican water treaty, Colorado River, Reverse osmosis, Electrodialysis, Drainage water, Salinity, Project Post-evaluation, Water use, Desalination apparatus.

Since the signing of the U.S.-Mexican water treaties (1944-1973), guaranteeing Mexico 1.5 MAF of Colorado River water annually and maintaining minimum salinity levels, U.S. researchers have been developing desalination techniques to make compliance with these agreements possible. A 60-acre desalting test facility has been constructed four miles west of Yuma, Arizona, with the intent of reclaiming drainage water from the Wellton-Mohawk irrigation district. Three major objectives of the project have been identified: (1) providing data on desalting models and equipment operated on pretreated water from the main conveyance channel, (2) allowing desalting manufacturers to gain experience with their equipment, and (3) providing criteria for the evaluation of desalting equipment proposed for the Yuma desalting plant. Eight reverse osmosis units and four electrodialysis units have been installed and operated in this facility to achieve these objectives. Between November 1974 and May 1978, these desalting units accumulated over 200,000 hours of operating time, and have been successful in accomplishing most of the objectives of the Colorado River Basin Salinity Control Project and provided invaluable design data relating to specific site problems. (Tickeys-Arizona)
W79-03139

FREEZE DESALINATION AND CONCENTRATION APPARATUS,

L. F. Smirnov, V. M. Parkhitko, and V. I.

Zverkhovsky.

U.S. Patent No. 4,112,702, 11 p, 2 fig, 2 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 629, September 12, 1978.

Descriptors: *Patents, *Desalination, *Water treatment, *Water purification, Sea water, *Freezing, Desalination processes, Crystallization, Equipment, Heat exchangers, Food processing industry, *Freeze desalination.

The freeze desalination and concentration apparatus may be used for desalination of sea and saline water, for producing high-grade potable distilled water with an output of up to 24 cu.m of distilled water per day on sea going vessels and other vehicles, as well as for water supply systems of small settlements in remote places. It may also be used in the food industry for concentration of various liquid food products. Desalination or concentration of solutions by freezing comprises three basic steps: formation of ice from solution; separation and washing of ice from brine; and ice melting. The desalination unit includes in flow sequence, a three-circuit heat exchanger, a condenser for a refrigerant and for melting the ice mass, and a cylindrical crystallizer having a separator with an auger arrangement mounted inside the crystallizer. An ice-cutting device is accommodated between the crystallizer and separator, and another ice-cutting device is provided between the casing of the desalination unit and the outer ice-forming surface of the crystallizer. (Sinha - OEIS)
W79-03312

APPARATUS FOR DESALINATING WATER BY REVERSE OSMOSIS,

Gesellschaft fuer Kernanergieverwertung in Schiffbau und Schiffahrt m.b.H., Geesthacht-Terperhude (Germany, F.R.) (Assignee).
K. W. Boddeker, and W. Hilgendorff.
U.S. Patent No. 4,115,274, 7 p, 6 fig, 2 ref; Official Gazette of the United States Patent Office, Vol 974, No. 3, p. 1490-1491, September 19, 1978.

Descriptors: *Patents, *Desalination, *Water treatment, Saline water, *Reverse osmosis, Membrane processes, *Desalination apparatus.

An apparatus for desalinating seawater by reverse osmosis has a series of porous discs each covered on both sides by a membrane, and compressed at their edges between respective pairs of a stack of module plates which are identical. Each module plates consist of two mirror image halves, alternate module plates in the stack being rotated through 180 degrees. A zig-zag flow path through the stack is thereby provided with desalinated water passing by reverse osmosis into the porous discs and hence radially outward of the stack for collection. (Sinha - OEIS)
W79-03326

3B. Water Yield Improvement

WATER HARVESTING FOR AFFORESTATION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,

Research Inst. of Forests and Rangelands, Tehran (Iran).

P. Mehdizadeh, A. Kowsar, E. Vaziri, and L.

Boersma.

Soil Science Society of America, Journal, Vol. 42, No. 4, p. 644-649, July-August, 1978. 5 fig, 2 tab, 21 ref.

Descriptors: *Water harvesting, *Asphalt, *Membranes, *Reforestation, *Water spreading, Rainfall-runoff relationships, Soil sealants, Surface runoff, Storm runoff, Water conservation, Water yield improvement, Slopes, Permeability, *Iran.

In Tehran and other large cities in arid regions, officials are interested in fighting atmospheric pollution by establishing city parks and greenbelts. Because insufficient water supplies are available to achieve this task, researchers have been investigating the possibility of collecting rainwater from impervious asphalt-line microwatersheds, both to

save water for domestic consumption and to decrease the probability of mass mortality of trees during drought. The technique was investigated on asphalt-lined runoff plots 2 meters wide and 10 meters long, and on 2 meter-wide terraces along contour lines at 5 meter intervals on a 30 percent sloped hillside. Results indicated a runoff efficiency of nearly 75 percent initially on the microwatersheds and high soil water content on the terraces of -4, -7.7, and -2.5 bars. After four years, however, the asphalt membrane began to deteriorate because of the freezing and thawing of the soil, growth of plants, and shrinking and swelling of clays, resulting in a drop to 25 percent efficiency. Further work, nevertheless, is being carried on to develop this technique as an alternative to conventional irrigation systems for the establishment of greenbelts in arid regions. (Tickeys-Arizona)
W79-03133

THE PUBLIC DECIDES ABOUT WEATHER MODIFICATION,

Colorado Univ., Boulder. Human Ecology Research Services.

B. C. Farhar.

Environment and Behavior, Vol. 9, No. 3, p 279-310, September 1977, 9 tab, 33 ref.

Descriptors: *Attitudes, *Decision-making, *Social values, *Social impact, *Artificial precipitation, *Cloud seeding, *Weather modification, *Social research, Agrometeorology, Direct benefits, Indirect benefits, South Dakota Weather Modification Program (SDWMP), National Hail Research Experiment, Rainfall augmentation.

Drawing from several studies, this article examines public attitudes and values toward weather modification programs in general, and cloud seeding in particular. The research, conducted on the social aspects of weather modification, involved two types of major efforts — the first involved surveys in 6 states focusing on citizen attitudes, opinion, knowledge, and beliefs about cloud seeding, and the second involved monitoring of large project areas in 24 states over a 6-year period between 1969 and 1975. Survey data indicate favorable attitudes toward the concept of weather modification and the effectiveness of cloud seeding, a low level of knowledge about weather modification, and a preference for decision-making and funding of weather modification programs to rest at the state or local level. Although most respondents feel they know little about weather modification programs, they tend to support these programs and to favor enabling legislation. Respondent do not appear to be too concerned about risk. Most respondents in agricultural area do not exhibit antiscientific or antitechnological bias. They tend to favor modification programs when they perceive direct or indirect economic benefits. Where economic harm might result for some groups while benefiting others, the probability of opposition to a program is increased; where a project has local sponsorship and local support over several years, even a large scale negative weather event (e.g., flash flooding) in the presence of cloud seeding may not produce organized opposition. Organized opposition has resulted in areas where seeding has been blamed for drought conditions. The author presents a number of unresolved questions with regard to weather modification and discusses decision roles. (Arnold-NC)
W79-03155

A REANALYSIS OF THE SKAGIT CLOUD SEEDING PROJECT,

Washington Univ., Seattle. Dept. of Atmospheric Sciences.

P. V. Hobbs, and A. L. Rangno.

Journal of Applied Meteorology, Vol. 17, No. 11, p 1661-1666, November 1978. 9 fig, 1 tab, 2 ref.

Descriptors: *Weather modification, *Cloud seeding, *Analytical techniques, *Washington, Regression analysis, Statistics, Runoff, Rainfall, Precipitation(Atmospheric), Silver iodide, Rivers, Data processing, Meteorology, Projects, *Skagit River(WA), *Skagit Cloud Seeding Project.

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3B—Water Yield Improvement

In a previous analysis by Hastay and Gladwell (1969) of the Skagit Cloud Seeding Project, the actual runoffs of the Skagit River during the two seeded years were compared to the runoffs predicted by a principal component (or covariate) analysis technique. It was concluded that seeding from ground generators with silver iodide increased the annual runoff of the Skagit River by at least 15% in the second year of the Skagit Project (the 1964 water year), and that this result was significant at the 0.005 (or higher) level. In this paper it was shown that this conclusion cannot be substantiated due to the inclusion in the analysis of a control river which behaved anomalously during the 1964 water year and on which the statistical significance of Hastay and Gladwell's result rests. Comparisons of the runoff of the Skagit river during the 1964 water year with the runoffs of two similarly situated rivers, with which the Skagit is well correlated historically, showed no significant effects due to seeding. (Sims-ISWS)

W79-03275

THE IMPENDING WATER FAMINE,
United Nations Educational, Scientific and Cultural Organization, Moscow (USSR). International Hydrological Programme.
For primary bibliographic entry see Field 6B.

W79-03435

3C. Use Of Water Of Impaired Quality

ECOLOGY AND ENVIRONMENT IN THE UNITED ARAB EMIRATES,
Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.
For primary bibliographic entry see Field 4C.

W79-03137

POTENTIAL USE OF FINELY DISINTEGRATED IRON PYRITE IN SODIC AND IRON-DEFICIENT SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.

W79-03423

THE SANDS OF WRATH: AMERICA'S DUST BOWL IN RETROSPECT,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 4C.

W79-03434

SALT OUTFLOWS FROM NEW AND OLD IRRIGATION LANDS,
Snake River Conservation Research Center, Kimberly, ID.
D. L. Carter, and C. W. Robbins.
Soil Science Society of America Journal, Vol. 42, No. 4, p 627-632, July-August, 1978. 3 fig, 3 tab, 13 ref.

Descriptors: *Sainity, *Leaching, Leachate, Drainage water, Water quality, *Salt balance, *Irrigated land, *Salts.

Three water application treatments with low salt water were applied to previously nonirrigated soil and to a similar soil which had been irrigated for 67 years. The total soluble salt content of these soils initially, and after one and two seasons of treatment, was measured to determine salt outflow. Residual soluble salts were essentially removed from the previously nonirrigated soil after 30 cm of water/m depth of soil had passed from the soil as leachate, regardless of the number of seasons required for that amount of leaching. The total quantity of residual salt removed from soil 5 m deep was 70 metric tons/ha, with about 38 metric tons/ha being leached out by the first 14 cm of leachate. After the residual salt was removed, the salt content of the newly irrigated soil was the same as that of the soil which had been irrigated for 67 years. Subsequent salt outflow from the soil was directly related to the quantity of water leaching through

the soil, indicating that more minerals dissolved with more leaching. Soils irrigated for many years and then not irrigated for up to 10 years had no measurable reaccumulation of soluble salts during the period of nonirrigation. (Skogerboe-Colorado State)

W79-03422

3D. Conservation In Domestic and Municipal Use

EVALUATION OF ALTERNATIVE STORM-WATER MANAGEMENT POLICIES,
Maryland Univ., College Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 6B.

W79-03039

MUNICIPAL WATER CONSERVATION ALTERNATIVES,

Pennsylvania State Univ., University Park. School of Forest Resources.

W. E. Sharpe.

Water Resources Bulletin, Vol. 14, No. 5, p 1080-1087, October 1978. 2 tab, 21 ref.

Descriptors: *Municipal water, *Water conservation, *Water policy, *Alternatives, Constraints, Pricing, Metering, Education, Programs, National goals.

The municipal water conservation options available to meet the goals of a national water conservation policy are evaluated. Water conservation with water conservation devices offers many significant advantages over education and pricing and metering as methods of accomplishing water conservation goals. Current constraints on the use of water conservation devices are outlined, and their elimination is suggested if the nation's water conservation goals are to be met. (Bell-Cornell)

W79-03092

PLANNING IN SMALL- AND MEDIUM-SIZE ILLINOIS MUNICIPAL WATER SYSTEMS,
Illinois Univ. at Urbana-Champaign.

J. C. van Es, and Richard J. Quigley.

Illinois Agricultural Economics, p. 17-23, January 1976, 7 tab, 12 ref.

Descriptors: *Municipal water, *Illinois, *Cities, *Planning, *Potable water, *Financial information.

This research deals with the planning and financial information aspects of small- and medium size water systems in Illinois; also, the social and organizational factors related to the provision of such a local service. The data are from a sample of 228 Illinois municipal water systems. Attempts to determine the relationships between planning and financial knowledge and municipal and water-system characteristics indicate a general weakness or absence of such relationships, although the relationships were consistently stronger for the municipal characteristics. The historical absence of the necessity to manage the water system other than in a routine fashion may have left these systems unprepared to meet future challenges.

W79-03097

OPTIMAL PLANNING FOR URBAN STORM DRAINAGE SYSTEMS,
Purdue Univ., Lafayette, IN. School of Civil Engineering.

For primary bibliographic entry see Field 6A.
W79-03107

PLANNING STORM-DRAINAGE SYSTEMS FOR URBAN GROWTH,
Purdue Univ., Lafayette, IN. School of Civil Engineering.

For primary bibliographic entry see Field 6A.
W79-03108

SYSTEMATIC PLANNING OF URBAN STORM-DRAINAGE UTILITIES,
Purdue Univ., Lafayette, IN. School of Civil Engineering.

For primary bibliographic entry see Field 6A.

W79-03109

DEVELOPING A STATEWIDE WATER INFORMATION SYSTEM FOR MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.

For primary bibliographic entry see Field 6D.

W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESOTA,

Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.

For primary bibliographic entry see Field 6D.

W79-03122

A NEW APPROACH TO URBAN WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.

For primary bibliographic entry see Field 6A.

W79-03124

WATER HARVESTING FOR AFFORESTATION: I. EFFICIENCY AND LIFE SPAN OF ASPHALT COVER,
Research Inst. of Forests and Rangelands, Tehran (Iran).

For primary bibliographic entry see Field 3B.

W79-03133

PRELIMINARY LISTING OF MUNICIPAL WATER SUPPLY CAPACITIES,
Oklahoma Foundation for Research and Development Utilization, Inc., Edmond.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 495. Price Codes: A11 in paper copy, A01 in microfiche. Economic Development Research Report No. EDA-OER-76-037, September 1976. 231 p, 1 tab. 99-7-13297, OER-489-G-76-16.

Descriptors: *Water supply, *Cities, *Municipal, *Storage capacity, *Data collections, Facilities, Water use, Human population, Rates, Water requirements, Consumption use.

A current listing of available data on U.S. water supply facilities in communities with a serviced population of over 2,000 is provided. The tabulated data are presented alphabetically by state and alphabetically by community name within the individual states. Statistics are given for: population served, water supply capacity in million gallons/day, average daily use in million gallons, per capita use rate, percent utilization of water supply capacity, and the potential population growth which would not impact on the existing system. (Davidson-IPA).

W79-03261

NOMOGRAPHS FOR TEN-MINUTE UNIT HYDROGRAPHS FOR SMALL URBAN WATER SHEDS,

American Society of Civil Engineers, NY. Urban Water Resources Research Council.

For primary bibliographic entry see Field 6B.

W79-03272

URBAN RUNOFF CONTROL PLANNING,
American Society of Civil Engineers, NY. Urban Water Resources Research Council.

For primary bibliographic entry see Field 6B.

W79-03273

BIBLIOGRAPHY OF THE GEOLOGY AND HYDROLOGY OF THE ALBUQUERQUE GREATER URBAN AREA, BERNALILLO AND

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WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Conservation In Industry—Group 3E

PARTS OF SANDOVAL, SANTA FE, SO-CORRO, TORRANCE, AND VALENCIA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.
For primary bibliographic entry see Field 10C.
W79-0339

3E. Conservation In Industry

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN RUBBER PROCESSING OPERATIONS,
Research Triangle Inst., Research Triangle Park, NC. Center for Technology Applications.
For primary bibliographic entry see Field 5B.
W79-03008

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION, FORMULATION OF ALDRIN/DIELDRIN, DDT, ENDRIN, TOXAPHENE,

Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5D.
W79-03015

CONSERVATION OF PETROLEUM WASTES AT RED RIVER ARMY DEPOT,
Red River Army Depot, Texarkana TX. Dept. of Maintenance Effective Engineering.
For primary bibliographic entry see Field 5E.
W79-03018

PROCEEDINGS OF THE FIFTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.

Pacific Northwest Environmental Research Lab., Corvallis, OR. Industrial Wastes Branch.
For primary bibliographic entry see Field 5D.
W79-03031

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.

For primary bibliographic entry see Field 5G.
W79-03057

COMMERCIAL SAILING VESSELS - AN ECONOMIC ASSESSMENT,
For primary bibliographic entry see Field 6B.
W79-03192

EXTRACTION, PRODUCTION AND INVESTMENTS IN CAPITAL AND LEARNING, THE NATURAL RESOURCES INDUSTRIES,

Tel Aviv Univ. (Israel). Foerder Inst. for Economic Research.
For primary bibliographic entry see Field 6B.
W79-03194

WASTE CLEARINGHOUSE AND EXCHANGES: NEW WAYS FOR IDENTIFYING AND TRANSFERRING REUSABLE INDUSTRIAL PROCESS WASTES,
Little (Arthur D.), Inc., Cambridge, MA.
For primary bibliographic entry see Field 5D.
W79-03254

THE CLOSED-CYCLE BLEACHED KRAFT PULP MILL,
B E and K, Inc., Birmingham, AL.
G. Rowlandson, and C. F. Cornell.
Appita, Vol. 32, No. 1, p 45-50, July, 1978. 8 fig, 16 ref.

Descriptors: *Kraft mills, *closed systems, *Water conservation, Water pollution sources, Water pollution control, Canada, Foreign countries, Economics, Water reuse, Recycling, Cooling water, Design, Water balance, Salts, Heat balance, Fiber

recovery, Chemical recovery, Pulp and paper industry.

The closed-cycle pulp mill eliminates water pollution through internal recycling techniques, the only discharge being clean cooling water. The system also reclaims heat, fiber, and chemicals previously lost in the pulp mill effluent. Important facets of the closed-cycle pulp mill are outlined, and descriptions are given of the closed-cycle mill design (including water balance), closed-cycle counter-current bleach plant, and salt recovery system. The economics of the closed-cycle system are compared to those of external effluent treatment schemes with specific reference to the closed-cycle kraft pulp mill of Great Lakes Paper Co. at Thunder Bay, Ontario. (Swichtenberg-IPC)
W79-03385

NEW SYSTEM IMPROVES STEAM ENERGY USAGE AT TENNESSEE BOX PLANT.
Boxboard Containers, Vol. 86, No. 1, p 45, August, 1978.

Descriptors: *Box plants, *Steam, *Condensates, *Water reuse, *Closed systems, Tennessee, Water pollution sources, Water pollution control, Water temperature, Water pressure, Industrial water, Operation and maintenance, Boilers, Recirculated water, Corrugating machines, Water conservation.

Union Camp Corp. of Morristown, Tennessee, installed a high-pressure steam condensate return system on its corrugator in 1974. It drains the corrugator of condensate and returns it directly to the boiler with a minimum drop in temperature and pressure. A trapless return system was installed in 1977, considerably reducing steam energy consumption and maintenance. In this closed system, automatic maintenance of the pressure differential keeps the system in balance. Condensate is returned to the boiler with little drop in temperature, thereby requiring less energy for corrugator operation. (Louden-IPC)
W79-03387

WATER CONSERVATION AT ELY (PAPER) MILL,

Ely Paper Mills (England).
R. G. Reid.
In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper No. 15, 6 p.

Descriptors: *Water conservation, *Pulp and paper industry, Foreign countries, Europe, Water pollution control, Water pollution sources, Turbines, Generators, Electric powerplants, Water treatment, Industrial water, Boiler feed water, Treatment facilities, Water supply, Water costs, England, Ely River(England).

The Ely Paper Mill (Cardiff, South Wales) of Wiggins Teape Ltd. (United Kingdom) is situated along the River Ely. The closing of an iron mine, pumping about 4,000,000 gallons of water per day into the river and the simultaneous substantial increase in the company's license to abstract water from the river prompted Ely Paper Mill to install a 2.3 megawatt back-pressure turbine generator and to modernize the (river) water treatment plant. The treated river water is used as boiler feedwater and for the manufacture of vegetable parchment paper. Even with the drought of 1976 the mill managed to keep production at previous levels with one-half the consumption of water. (Swichtenberg-IPC)
W79-03389

HOW TWO BOARD MILLS HAVE CLOSED THEIR WATER SYSTEMS,
T.P.T. Ltd. (England). Board Div.
P. H. Trevanian.

In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper No. 16, 18 p, 7 fig.

Descriptors: *Water reuse, *Pulp and paper industry, *England, *Board mills, Water conservation, Foreign countries, Europe, Water pollution control, Water pollution sources, Recycling slime, Odor, Corrosion, Water temperature, Closed systems, Industrial water.

Reuse of clarified water has reduced effluent discharge from 20,000 to 1,800 gal/hr and from 35,000 to 7,000 gal/hr at the Oakwood and Stainland Mills of T.P.T. Ltd.'s Board Division (United Kingdom), respectively. Flow charts are presented of the water reuse systems at both board mills which operate a total of 3 multivat board machines to produce primarily chipboard and tube board. Slime, odor, corrosion, and high temperature problems have been minor at the Oakwood mill. (Swichtenberg-IPC)
W79-03390

ONE MILL'S APPROACH TO EFFLUENT TREATMENT,
Bowater Scott Corp. Ltd., Northfleet (England).
For primary bibliographic entry see Field 5D.
W79-03391

HOW SOME NORWEGIAN PAPER MILLS HAVE REDUCED THEIR FIBRE LOSSES,
Norwegian Pulp and Paper Research Inst., Oslo.
J. A. Oksum.

In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper 18, 13 p, 5 fig, 2 ref, 1 tab.

Descriptors: *Water conservation, *Fiber recovery, *Pulp and paper industry, *Norway, Foreign countries, Europe, Water reuse, Recycling, Water pollution control, Water pollution sources, Pulp wastes, White water(Paper machines), Pulp rejects, Industrial water.

A review is presented of the fiber recovery and water conservation programs which were implemented in Norwegian glassine, creped, kraft, printing, and writing paper mills under the direction of the Norwegian Pulp and Paper Research Institute. These schemes include use of filtered and uncleaned white water, recovery of centricleaner pulp rejects, and fiber recovery using wet-broke and lamella thickeners. (Swichtenberg-IPC)
W79-03392

WATER SAVING CHECK LIST PREPARED FOR UK (UNITED KINGDOM) PAPER AND BOARD MILLS.
Paper (London), Vol. 186, No. 5, p 276, September 6, 1976.

Descriptors: *Pulp and paper industry, *England, *Water consumption(Except consumptive use), Water conservation, Foreign countries, Europe, Water pollution control, Water pollution sources, Industrial water.

A 25-item checklist is given which has been prepared by the British Paper and Board Industry Federation (BPBIF) for aiding member-corporation mills in reducing their water consumption. Statistics gathered by BPBIF indicate that specific water utilization (gal/ton of product) has been cut by 33% between 1968 and 1974. (Brown-IPC)
W79-03402

FLOAT-WASH SYSTEM, CLOSING OF THE WATER CIRCULATION SYSTEM IN THE PULP AND PAPER INDUSTRY (FLOAT-WASH SYSTEM, SCHLIESSEN DES WASSERKREISLAUFES IN DER ZELLSTOFF- UND PAPIER-INDUSTRIE),
For primary bibliographic entry see Field 5D.
W79-03406

THE CLOSED WATER CIRCUIT OF THE ALZENAU FLUTING BOARD AND PAPER MILL (DER GESELLSCHE WASSERKREISLAUF

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3E—Conservation In Industry

DER WELLPAPPEN- UND PAPIERFABRIK ALZENAU,
Der Papiermacher, Vol. 28, No. 6, p. 92-94, June 10, 1978. 1 fig, 3 illus.

Descriptors: *Water conservation, *Pulp and paper industry, *Closed systems, Waste water treatment, Water pollution sources, Water pollution treatment, Effluents, Flocculation, Sludge, Freshwater, Evaporation, Foreign countries, Recycling, Chemical precipitation, Water quality control, Germany, Corrugating medium(Fluting paper), Linerboard, Board mills, Industrial water.

The water circuit of the mill's fourdrinier machine with secondary former manufacturing 100 tons/day of test linerboard and corrugating medium was closed. The system used involved mixing the effluent with a flocculating agent and pumping it to a contact-sludge clarifier with a capacity of 600 cu m, where the solids content is reduced from 1830 to 15 mg/liter at a throughput rate of 3000 liters/min. Fresh water is still added to the mill's process water to make up for the 120 cu m of water evaporated daily by the paper machine drying cylinders. (Speckhard-IPC)
W79-03407

THE CLOSED CYCLE CONCEPT KRAFT MILL AT THE GREAT LAKES PAPER CO., LTD., Great Lakes Paper Co., Ltd., Thunder Bay (Ontario).
J. A. Isbister, D. W. Reeve, and W. H. Rapson. Pima (Paper Industry Management Association) Magazine, Vol. 60, No. 8, p. 23-29, August 1978. 3 fig, 9 ref, 6 tab.

Descriptors: *Water conservation, *Kraft mills, *Water pollution control, *Closed systems, Water pollution sources, Operation and maintenance, Canada, Foreign countries, Pulp wastes, Bleaching wastes, Foaming, Pulp and paper industry, Salts, Corrosion, Equipment, Spill control, Black liquor, Condensates, Recycling.

Problems encountered, their solutions, and the operating results to date are reviewed following the startup of the salt removal process in March 1977 at the closed-cycle bleached kraft market pulp mill of Great Lakes Paper Co. Ltd. in Thunder Bay, Ontario. Flowsheets and brief descriptions are presented for the bleach plant filtrate recovery system, the closed brown stock screening and brown decker-washer system, and the salt recovery operations. The spill control system and stripping of black liquor evaporator condensates are also discussed. Corrosion of the recovery furnace precipitator and bleach plant towers, foaming in the bleach plant and brown stock decker seal tanks, and an increase in chemical consumption in the D/C and D-1 bleaching stages (D = chlorine dioxide and C = chlorination) have been noted. (Schwichtenberg-IPC)
W79-03409

POLLUTION CONTROL REGULATIONS AND MONITORING TECHNOLOGY: A REVIEW OF RESEARCH AND DEVELOPMENT FROM THE PULP AND PAPER INDUSTRY, Victoria Univ. (British Columbia). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-03410

3F. Conservation In Agriculture

A FIELD STUDY OF THE EFFECT OF WATER DEFICIT ON WATER USE EFFICIENCY, Kansas Water Resources Research Inst., Manhattan.
For primary bibliographic entry see Field 21.
W79-03036

EVALUATION OF URBANIZATION AND CHANGES IN LAND USE ON THE WATER RESOURCES OF MOUNTAIN VALLEYS, Idaho Univ., Moscow. Dept. of Civil Engineering.

For primary bibliographic entry see Field 4C.
W79-03042

TRANSIENT AND STEADY FLOW FROM SUB-SURFACE LINE SOURCES AT CONSTANT HYDRAULIC HEAD IN ANISOTROPIC SOIL, Science and Education Administration, Riverside, CA. Salinity Lab.

For primary bibliographic entry see Field 2G.
W79-03048

RESPONSIVENESS OF SOIL EROSION LOSSES IN THE CORN BELT TO INCREASED DEMANDS FOR AGRICULTURAL PRODUCTS, Arizona Univ., Tucson. Dept. of Agricultural Economics.

D. C. Cory, and J. F. Timmons. Journal of Soil and Water Conservation, Vol. 33, No. 5, p. 221-226, September 1978. 1 fig, 4 tab, 24 ref.

Descriptors: *Erosion, *Iowa, *Illinois, *Corn belt, Soil erosion, Agriculture, Export, Economics, Equations, Model studies, Soil losses, Soil erosion losses, Regional model, Universal soil loss equation.

The estimated soil erosion losses resulting from increased agricultural production between a base period, 1969-1971, and 1985 in 12 Corn Belt states under two future scenarios were examined. These scenarios are composed of alternative sets of export demands, land management and erosion control practices, product prices, and farm policies. Scenario I, which assumes a continuation of historical trends, results in a 17% increase in planted crop acres and a 39% increase in soil erosion losses. These losses vary from 68% in Iowa to 8% in Kansas. Scenario II, featuring increased production because of higher exports, results in a 29% increase in planted crop acres and a 72% increase in soil erosion losses. The losses in this case vary from 106% in Iowa to 40% in Illinois. (Lee-ISWS)
W79-03064

FATE OF HERBICIDES CNP IN RIVERS AND AGRICULTURAL DRAINAGES, Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).
For primary bibliographic entry see Field 5B.
W79-03065

SYSTEMS ANALYSIS APPLIED TO AGRICULTURAL WATER DEMAND, International Inst. for Applied Systems Analysis, Luxenburg (Austria).
For primary bibliographic entry see Field 6D.
W79-03087

ROW SPACING AND DIRECTION EFFECTS ON WATER UPTAKE CHARACTERISTICS OF PEANUTS, Oklahoma State Univ., Stillwater.
E. W. Chin Choy, J. F. Stone, and J. E. Garton. Soil Science Society of America Journal, Vol. 41, No. 2, p. 428-432, March-April, 1977. 5 fig, 2 tab, 14 ref.

Descriptors: *Evapotranspiration, *Peanuts, Crop response, Crop production, *Cultivation, *Row spacing, Water utilization.

Peanuts grown in 30-cm wide, north-south rows, lost less water to evapotranspiration than those grown in 90-cm rows or than east-west rows of these spacings. Plants grown in 90-cm wide, north-south rows tended to have the highest water losses. The reason for this phenomenon was not determined, although there is reason to believe net radiation is lower in narrow rows than wide. Yield of peanuts was enhanced by the narrow rows and no orientation effect on yield was noted. This, water-use efficiency was increased by both yield effect and water conservation effect. Peanut quality was the same for all treatments. There is no reason to believe that the water conserving effect is unique

to peanuts. Research on other crops in similar geometries is to be encouraged. (Skogerboe-Coldrado State)
W79-03094

A METEOROLOGICAL APPROACH TO THE IDENTIFICATION OF DROUGHT SENSITIVE PERIODS IN FIELD CROPS, Orange Free State Univ., Bloemfontein (South Africa).

For primary bibliographic entry see Field 2B.
W79-03130

ALTERNATIVES FOR MANAGING A FINITE GROUNDWATER SUPPLY IN AN ARID REGION, Arizona Univ., Tucson. Office of Arid Lands Studies.

For primary bibliographic entry see Field 4B.
W79-03131

A 'NEW WEST' RECLAMATION TRAGEDY: THE TWIN FALLS-OAKLEY PROJECT IN IDAHO, 1908-1931, Boise State Univ., ID.
H. T. Lovin. Arizona and the West, Vol. 20, No. 1, p. 5-24, Spring 1978. 4 fig, 30 ref.

Descriptors: *History, *Irrigation districts, *Idaho, *Reclamation states, *Land reclamation, Political aspects, Social aspects, Legislation, Water rights, Project feasibility, Economic impact, *Twin Falls-Oakley Project(Ida), Snake River plain(Ida).

Under the Newlands and Carey Acts, the sparsely inhabited arid regions west of the Rockies became known at the turn of the century as the New West, the site of dozens of Federal and state reclamation projects. One such, the Twin Falls-Oakley project on the study of the difficulties of settling this uncertain landscape, unfamiliar to its new settlers. In this historical account we learn that the project was speedily approved by the Idaho Land Board and 43,893 acres segregated for construction of irrigation works capable of serving the region, with the promoters obtaining the rights to sell water rights and services to the area's farmers. The district opened in 1909 with high expectations on the part of investors risking sums calculated between one and a half and two and a quarter million dollars. But misfortune and bad planning beset the project from the beginning. The lack of proper soil, geological, or water studies, together with engineering miscalculations caused long delays and serious physical problems, which in turn precipitated financial and political difficulties that haunted the district until 1931 when litigation ceased with practically everybody the loser. Implications for subsequent reclamation project can be read into the details of this early disaster. (Ticke-Arizona)
W79-03132

ANTHROPOGENIC IMPACT ON THE ALBEDO OF THE EARTH, Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.
For primary bibliographic entry see Field 2B.
W79-03134

ISRAEL: WHERE IRRIGATION IS AN ART, R. Ross. Irrigation Age, Vol. 13, No. 2, p. 66-68, October, 1978, 3 fig.

Descriptors: *Irrigation operation and maintenance, *Irrigation systems, *Irrigation practices, Distribution systems, Computer programs, Water conservation, Labor supply, Management, *Israel.

A coordinated irrigation control system at Kibbutz Saad in Israel is described. The system, including its master control station, field units, and electric solenoids has greatly reduced irrigation labor requirements for this and other settlements in this small progressive country. The operation and function of the system, developed by Motorola Israel

WATER SUPPLY AUGMENTATION AND CONSERVATION—Field 3

Control Conservation In Agriculture—Group 3F

Ltd. is described, from the initial decision to computerize the release of water and the troubleshooting abilities of the field units. In addition to minimizing labor and error, the system has been found to aid in water conservation and utilization efforts, help produce higher yields, and refine management techniques. (Tickes-Arizona)
W79-03136

MINIMUM STREAMFLOWS: THE LEGISLATIVE ALTERNATIVES,
For primary bibliographic entry see Field 6E.
W79-03206

AGRICULTURAL WATER QUALITY ACT.
For primary bibliographic entry see Field 6E.
W79-03225

WATER FOR FIVE CENTRAL ARIZONA INDIAN TRIBES FOR FARMING OPERATIONS.
For primary bibliographic entry see Field 6E.
W79-03227

PROTECTION AND ENHANCEMENT OF SOIL AND WATER RESOURCES.
For primary bibliographic entry see Field 6E.
W79-03234

TRADE-OFFS BETWEEN EROSION CONTROL AND PRODUCTION COSTS IN U.S. AGRICULTURE,
Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 4D.
W79-03284

THE PESTICIDE CONTENT OF SURFACE WATER DRAINING FROM AGRICULTURAL FIELDS—A REVIEW,
Science and Education Administration, Stoneville, MS. Southern Weed Science Lab.
For primary bibliographic entry see Field 5B.
W79-03289

NUTRIENT RUNOFF FROM FERTILIZED AND UNFERTILIZED FIELDS IN WESTERN CANADA,
Department of Agriculture, Swift Current (Saskatchewan). Research Station.
For primary bibliographic entry see Field 5B.
W79-03290

FLUSH-DRIP IRRIGATION Emitter,
M. H. Christy, and L. Spencer.
U.S. Patent No. 4,113,180, 5 p, 12 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 792, September 12, 1978.

Descriptors: *Patents, *Irrigation, *Irrigation practices, *Irrigation efficiency, Flow control, Application equipment, Flush-drip irrigation.

A flush-drip irrigation emitter includes a compact emitter element, a housing enclosing the emitter element and an insect guard. The emitter element has a pair of confronting oppositely arched flexible walls defining a flush flow passage with sharp lateral edges. One of the walls has at least one drip duct, the walls being responsive to a minimal pressure difference to collapse against each other in mutual sealing relation and confine flow to the drip duct. The housing includes telescopic complementary housing components provided with an inlet connected to a water supply and an outlet. The emitter element includes sealing means interposed between the housing components. The housing components have mutually engageable latch elements and a tool receiving channel to effect separation. The outlet is arranged to receive directly or indirectly through a small irrigation tube, and insect guard. (Sinha—OEIS).
W79-03313

HIGH RISE SPRINKLERS,

K. T. Sheets.
U.S. Patent No. 4,113,181, 10 p, 8 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 793, September 12, 1978.

Descriptors: *Patents, *Irrigation, *Sprinkler irrigation, Irrigation practices, Irrigation efficiency, Nozzles, Application equipment, Floats, Water delivery.

High rising projectable sprinklers rise automatically from the ground when water is supplied under pressure to the sprinklers. The projectable sprinklers include a generally cylindrical housing closed at the bottom and sunked in the ground. A projectable float floats upward within the housing when water is supplied under pressure to the sprinkler. The sprinkler head includes a rotating nozzle or nozzles attached to the top of the float. (Sinha—OEIS).
W79-03314

FIELD MEASURED AND SIMULATED CORN LEAF WATER POTENTIAL,

Agricultural Research Service, Morris, MN.
For primary bibliographic entry see Field 21.
W79-03361

STUDIES ON THE USE OF COAGULATION AIDS FOR TREATMENT OF BOILER FEED-WATER (CERCETARI PRIVIND UTILIZAREA ACCELERATORILOR DE COAGULARELA TRATAREA APELOR DE ALIMENTARE A CAZANELOR),
F. Nicifor.
Celuloza si Hirtie, Vol. 26, No. 4, p 162-167, October-December, 1977. 2 fig, 8 tab.

Descriptors: *Boiler feed water, *Water treatment, *Coagulation, Industrial water, Silica, Iron, Hardness(Water), Water softening, Polyacrylamide.

Laboratory studies are reported on the comparative efficiency of several nonionic and anionic commercial coagulants of the Medasol type, as well as of experimental nonionic and anionic, hydrolyzed and nonhydrolyzed polyacrylamide preparations, for the removal of silica, iron, and hardness components from high-pressure boiler feedwaters. (Brown-IPC)
W79-03393

RESPONSE OF CORN TO ZN IN ORTHO- AND PYROPHOSPHATE FERTILIZERS, AS AFFECTED BY SOIL TEMPERATURE AND MOISTURE,

National Fertilizer Development Center, Muscle Shoals, AL.
P. M. Giordano, and J. J. Mortvedt.
Agronomy Journal, Vol. 70, No. 4, p 531-534, July-August, 1978. 2 fig, 2 tab, 8 ref.

Descriptors: *Fertilizers, *Phosphates, Sweet corn, *Zinc, Phosphorus, *Soil temperature, *Soil moisture, Crop response, Plant growth, *Corn.

The purpose of this investigation was to determine the effects of both soil temperature and moisture regimes on the uptake of Zn and P by corn (*Zea mays L.*) from ZnSO_4 , granulated with ammonium ortho- and pyrophosphate fertilizers and applied to Nolichucky silt (pH 7.6), a Typic Paleudult soil. In a series of greenhouse experiments, corn grown under various soil temperature (16 to 32°C) and moisture regimes (0.3 to 0.15 atm) showed a marked reduction in dry matter yield, as well as in Zn and P uptake, at low temperature, but varying soil moisture levels had little effect. Uptake of Zn was greater when triammonium pyrophosphate rather than monoammonium phosphate was the source of applied P, but uptake of P from the two P sources was comparable. Although lower Zn uptake appears to be a function of depressed growth under cool soil conditions, it is likely that deficiency arises because early Zn requirements cannot be met when the available Zn supply is low. Uptake and yield results further suggest that

early growth retardation sometimes attributed to Zn deficiency during cool springs also may be related to suppression of P uptake. (Skogerboe—Colorado State).
W79-03399

HYDROLOGIC IMPACT OF GRAZING ON INFILTRATION: A CRITICAL REVIEW,
Utah State Univ., Logan. Watershed Science Unit.
For primary bibliographic entry see Field 4C.
W79-03416

SUGARBEET GENOTYPE, N, AND SOIL MOISTURE AVAILABILITY INTERACTIONS IN COMPONENTS OF BEET YIELD AND QUALITY,

Utah State Univ., Logan. Dept. of Applied Statistics and Computer Science.
D. W. James, D. L. Doney, J. C. Theurer, and R. L. Hurst.
Agronomy Journal, Vol. 70, No. 4, p. 525-531, July-August, 1978. 8 fig, 2 tab, 16 ref.

Descriptors: *Sugar beets, *Nitrogen, *Soil moisture, Crop response, *Crop production, Varieties.

This study was conducted to investigate the genotype of sugarbeet (*Beta vulgaris L.*) X soil N and genetic base. A series of 20 genetically different genotypes differing in yield, sugar percent, and impurity index potential were field tested in 1974 at four N levels: 0, 84, 210, and 525 kg/ha. In 1975, eight genetically diverse genotypes were field tested at five N levels and four irrigation levels. The soil type was a coarse, loamy mixed mesic family of calcic haploerolls. Analysis of data were for root yield, sucrose percent, gross sugar, and impurity index. Highly significant main effects due to N in 1974 and 1975 and water in 1975 were observed for all measured parameters. A significant genotype (V) X (N) interaction was obtained in 1974 for all parameters. There was an apparent genotype X water interaction in 1975; however, unbiased statistical inferences could not be made because of the experimental design. These interactions indicate that genetic variation exists such that new cultivars may be developed that give high sugar production at low N levels or are not affected adversely in quality at a high N level. (Skogerboe—Colorado State).
W79-03418

UPTAKE OF CADMIUM FROM PHOSPHATE FERTILIZERS BY PEAS, RADISHES, AND LETTUCE,

Corvallis Environmental Research Lab., OR.
For primary bibliographic entry see Field 21.
W79-03424

YIELDS, NUTRIENT REMOVAL, AND NUTRIENT CONCENTRATIONS OF DOUBLE-CROPPED CORN AND SMALL GRAIN SILAGE,

Kentucky Univ., Lexington. Dept. of Agronomy.
L. W. Murdoch, and K. L. Wells.
Agronomy Journal, Vol. 70, No. 4, p 573-576, July-August 1978. 7 tab, 7 ref.

Descriptors: *Sweet corn, *Barley, *Oats, *Silage, Crop response, Crop production, Nutrient removal, *Kentucky.

The study was initiated to determine production levels from double-cropped silage, the most compatible small grain species for double-cropped silage, and the rate and method of fertilizer application needed for high production. Field experiments were established on Huntington (fine-silty, mixed mesic fluventic Hapludol) and Pope (coarse-loamy, mixed, mesic fluventic Dystrochrept) soils. Three fertility levels were tested with 392-128-280, 280-89-232, or 168-54-140 kg/ha of N-P-K being applied each year. Single and split applications of K were studied. Barley (*Hordeum vulgare L.*) and oats (*Avena sativa L.*) were compared as small grain species. This study indicates that double-cropped corn and small grain for silage can

Field 3—WATER SUPPLY AUGMENTATION AND CONSERVATION

Group 3F—Conservation In Agriculture

result in substantially higher dry matter production per unit land area than single-cropped corn. Large amounts of minerals are removed, however, particularly K, by the small grain component of the double-cropping system. (Skogerboe-Colorado State)
W79-03426

POTASSIUM UPTAKE BY ONION ROOTS CHARACTERIZED BY POTASSIUM/RUBIDIUM RATIO,
Purdue Univ., Lafayette, IN. Dept. of Agronomy.
For primary bibliographic entry see Field 21.
W79-03431

DEPENDABILITY OF SELF-PROPELLED SPRINKLER SYSTEMS,
Colorado State Univ., Fort Collins. Environmental Resources Center.
J. W. Addink.
Irrigation Journal, Vol. 1, No. 2, p 18-19, March-April 1971. OWRT B-039-COLO(6).

Descriptors: *Center-pivot sprinklers, *Sprinkler systems, Automatic irrigation system, Performance.

Center-pivot sprinkler systems have become very popular in the past ten years. However, several center-pivot companies have failed and nearly every company in the business has had failures on individual installations. Four areas play essential roles in determining the success of the systems and the companies manufacturing and selling them. The four areas are: design, sales, setup and service. Each of these areas is discussed.
W79-03441

4. WATER QUANTITY MANAGEMENT AND CONTROL

4.A. Control Of Water On The Surface

SOME LOCAL ECONOMIC IMPACTS OF THE MISSOURI RIVER RESERVOIRS WITHIN SOUTH DAKOTA (EFFECTS OF CONSTRUCTION, RECREATION, AND IRRIGATION AS REVEALED BY ANALYSIS OF SECONDARY DATA),
South Dakota State Univ., Brookings. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-03001

OPTIMIZATION MODEL FOR THE EVALUATION OF FLOOD-CONTROL BENEFITS OF MULTIPURPOSE MULTIRESEVOIR SYSTEMS,
Texas Univ. at Center for Research in Water Resources.
For primary bibliographic entry see Field 6A.
W79-03044

IMPACT OF HYDROLOGIC UNCERTAINTIES ON FLOOD INSURANCE,
Texas Univ. at Austin. Center for Research in Water Resources.
For primary bibliographic entry see Field 6F.
W79-03053

SOME THEORETICAL AND MEASUREMENT ISSUES IN ECONOMIC ASSESSMENT OF INTERBASIN WATER TRANSFERS,
California Univ., Berkeley.
For primary bibliographic entry see Field 6B.
W79-03080

ANALYZING HYDROLOGIC UNCERTAINTY AND ITS IMPACT UPON DECISION MAKING IN WATER RESOURCES,

Princeton Univ., NJ. Dept. of Civil Engineering. E. F. Wood.
Advances in Water Resources, Vol. 1, No. 5, p 299-305, September 1978. 4 fig, 2 tab, 23 ref.

Bayesian Inference and Decision Theory tools are applied to the problem of synthetic hydrology when model and parameter uncertainty exist. Issues such as optimal parameter estimation, use of synthetic generation in design problems, and the effects of parameter uncertainty on statistical estimation are discussed and applied to the problem of reservoir storage-yield analysis. It is concluded that parameter and model uncertainty arising from short hydrologic records can have a significant influence upon water resource designs. The decision theory approach will allow an analyst to develop statistical estimators in conjunction with the engineering decision problem at hand, leading to better designs than if the traditional approach were taken. (Bell-Cornell)
W79-03093

INTER-DISTRICT WATER ALLOCATIONS VIA LINEAR PROGRAMMING AND LINEAR PROGRAMMING DECOMPOSITION,
Iowa Univ., Iowa City. Inst. of Hydraulic Research.

M. Seki, and T. E. Croley, II.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 942, Price codes: A11 in paper copy, A01 in microfiche. IIRR Report No. 207, September 1977. 214 p, 10 fig, 77 tab, 28 ref, 2 appen.

Descriptors: *Water allocation(Policy), *Linear programming, *Watersheds(Basins), *Decomposition technique, *Yamato River basin(Nara, Japan), *Cost minimization, Economic feasibility, Political aspects, Environment, Constraints, water management(Applied), Equations, Mathematical models, Systems analysis, Human factors.

An interdistrict water flow table is developed to account for all water flows within a river basin and to identify all water-related variables for analysis. Linear models are identified for hydrologic variables, environmental variables, human factor variables, water use and water demand. Formulations of economic, political, environmental and population objectives are made along with the constraint formulations of these objectives. Several models of water allocations are thus available with the main objective expressed in the objective function and with all others in constraint form. The equations of continuity and motion are also encapsulated in the model. A case study of the Yamato River basin in Nara, Japan is made, and both linear programming and linear programming decomposition are applied as tools in the minimization of total cost. The final optimum allocation differs little from the existing allocation, indicating the present system is near-optimum with respect to total cost. The decomposition principle application allows for useful insight into decentralized decision making, although it proved to be a poorer tool for analysis in the example. The linear programming formulation and the computer program for analysis with the decomposition principle are presented. (Bell-Cornell)
W79-03091

A NONLINEAR PROGRAMMING ALGORITHM FOR REAL-TIME HOURLY RESERVOIR OPERATIONS,
California Univ., Los Angeles. Dept. of Engineering Systems.

W. S. Chu, and W. W-G. Yeh.
Water Resources Bulletin, Vol. 14, No. 5, p 1048-1063 October 1978. 2 fig, 3 tab, 31 ref.

Descriptors: *Reservoir operation, *Optimization, *Multiple-purpose projects, *Hydroelectric power, *Nonlinear programming, Real-Time, Decision making, Constraint, Methodology, Regression analysis, Reservoir storage, Mathematical models, Systems analysis, Equations, Power output maximization, Lagrangian procedures, Schedule, Shasta Reservoir(Calif), Hourly, *California.

The optimization of real-time operations for a single reservoir system is studied. The objective is to maximize the output of hourly power generation over a period of one day subject to constraints of hourly power schedules, daily flow requirement for water supply and other purposes, and the limitations of the facilities. The problem has a nonlinear concave objective function with nonlinear concave and linear constraints. Nonlinear Duality Theorems and Lagrangian Procedures are applied to solve the problem where the minimization of the Lagrangian is accomplished by a modified gradient projection technique along with an optimal step-size determination routine. The dimension of the problem in terms of the number of variables and constraints is reduced by eliminating the 24 continuity equations with a special implicit routine. A numerical example is presented using data provided by the Bureau of Reclamation, Sacramento, California. (Bell-Cornell)
W79-03093

SYSTEMATIC PLANNING OF URBAN STORM-DRAINAGE UTILITIES,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-03109

A 'NEW WEST' RECLAMATION TRAGEDY, THE TWIN FALLS-OAKLEY PROJECT IN IDAHO, 1908-1931,
Boise State Univ., ID.
For primary bibliographic entry see Field 3F.
W79-03132

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W79-03140

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W79-03141

SUSQUEHANNA RIVER BASIN STUDY: SUMMARY,
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03142

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT A-PLAN FORMULATION.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03143

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT B-PROGRAM SUMMARY.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03144

ACCOMPLISHMENT PLAN, REGION VIII, UTAH LAKE-JORDAN RIVER BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W79-03149

NEW ENGLAND REGION SUMMARY REPORT: SEVERE RESOURCE PROBLEMS AND RECOMMENDATIONS FOR THEIR RESOLUTION-1975 ASSESSMENT OF WATER AND RELATED LAND RESOURCES.

New E MA.
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RED R Envir Region For p W79-0

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WATER QUANTITY MANAGEMENT AND CONTROL—Field 4

Control Of Water On The Surface—Group 4A

New England River Basins Commission, Boston, MA.
For primary bibliographic entry see Field 5G.
W79-03151

RED RIVER OF THE NORTH BASIN.
Environmental Protection Agency, Denver, CO.
Region VIII.
For primary bibliographic entry see Field 5G.
W79-03156

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, POTTER COUNTY PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
Prepared for Potter County Planning Commission, PA, July 1977. 35 p, 11 fig, 10 plates, 7 tab.

Descriptors: *Pennsylvania, *Allegheny River(PA), *Flood data, *Peak discharge, Floods, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood stages, Flood peak, Flow duration, Stage-discharge relations, Flood protection, Non-structural alternatives, Warning systems, Control structures, Channel improvement, Potter County(PA), Coudersport(PA), 100-year flood, 500-year flood, Roulette(PA).

The study area is the flood plain of the Allegheny River within the limits of Potter County. The floodplain in Potter County is generally flat consisting primarily of farmland, wetland, and lowland. The communities of Coudersport and Roulette have significant residential and industrial development within the flood plain. Flood data were obtained from an Army Corps Wire Weight Gage, gaging records for similar drainage basins and historical records. The major flood season is from December to April, resulting from heavy rain and snow melt. Large floods can occur at any time. There are no flood control dams or reservoirs affecting floods in Potter County, but a channel improvement project was built by the Commonwealth of Pennsylvania, designed to accommodate a discharge of 10,000 cubic feet per second (cfs) with a minimum of bank overflow. The maximum known flood occurred at Roulette in July 1942, with a discharge of 18,500 cfs, reaching a high water mark of 1532.5 feet above mean sea level (msl). At the same location the 100-year frequency flood would discharge 18,000 cfs and crest at 153.1 feet msl, and the 500-year frequency flood would discharge 28,000 cfs and reach an elevation of 1532.9 feet msl. Several bridges in the area would be submerged during high flows, and three are obstructive to flood flow. This report provides a suitable basis for the adoption of land use controls to guide flood plain development. (Coan-NC)
W79-03158

FLOOD PLAIN INFORMATION: WHITE RIVER, SECOND BRANCH, THIRD BRANCH AND AYERS BROOK, RANDOLPH AND BETHEL, VERMONT.

Army Engineer District, Waltham, MA.
December 1973, 30 p, 14 fig, 22 plates, 6 tab.

Descriptors: *Vermont, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Stage-discharge relations, Flood protection, Non-structural alternatives, Warning systems, Land use, Control structures, Dam, Reservoirs, Standard Project Flood, *White River(VT), Randolph(VT), Bethel(VT), Ayers Brook(VT), Intermediate Regional Flood.

The study area includes the White river basin, the Second Branch, and Third Branch tributaries and Ayers Brook. The flood plains of the study area are relatively narrow and the majority of the land is equally divided between woodlands and agricultural areas. Flood data were obtained from three U.S. Geological Survey gaging stations, historic records, and topographic maps. Major floods in the White River Valley have occurred during all seasons of the year except mid-winter. The most severe floods generally result from intense rainfall.

A major multipurpose dam and reservoir project was authorized as early as 1936, but it is listed in an inactive status. The highest flood on the White River at Bethel occurred in September 1938 with a peak discharge of 32,200 cubic feet per second (cfs); and at West Hartford the worst flood occurred in 1927, discharging 120,000 cfs. The most severe flood recorded on Ayers Brook at Randolph occurred in June 1973, with a peak discharge of 4,070 cfs. Future flood peak discharges for the White River near Bethel would be 64,000 cfs for the Intermediate Regional Flood (IRF) and 103,000 cfs for the Standard Project Flood (SPF). IRF discharges for the Second Branch and Third Branch tributaries occurring at their mouths would be 15,000 cfs and 29,000 cfs, respectively, and the SPF discharges would be 25,000 cfs and 49,000 cfs, respectively. This report provides baseline information for developing a comprehensive flood management program. (Coan-NC)
W79-03159

FLOOD PLAIN INFORMATION: PASSUMPSIC AND MOOSE RIVERS, TOWN OF ST. JOHNSBURY, VERMONT.

Army Engineer District, Waltham, MA.
Prepared for Town of St. Johnsbury, December 1972, 25 p, 10 fig, 12 plates, 7 tab.

Descriptors: *Flood data, *Peak discharge, *Vermont, Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood stages, Flood peak, Flood damage, Ice jams, Flood protection, Non-structural alternatives, Flood plain zoning, Warning systems, Land use, Planning, Zoning, Standard project flood.

The study area is the portion of the town of St. Johnsbury, Vermont subject to flooding from the Passumpsic and Moose Rivers. Land use in the flood plains is residential, industrial, and commercial; severe damage has occurred in past floods. Flood data were obtained from four U.S. Geological Survey gauging stations, interviews with local residents, historical records and maps. Major floods occur during all seasons, but the main flood season is Spring. Major causes of floods are a combination of heavy rainfall, snowmelt and ice jamming. There are no existing flood control projects. The highest flood stages on the Passumpsic River were recorded at Passumpsic, VT in November 1927, with an estimated peak discharge of 42,500 cubic feet per second (cfs), cresting at 521.5 feet mean sea level (msl). The worst flood on the Moose River occurred at St. Johnsbury in March 1936, discharging 4,780 cfs, and cresting at 590.7 feet msl. The Intermediate Regional Flood (IRF) on the Passumpsic River (at River Mile 8) and the Moose River (at the mouth) would discharge 33,000 cfs and 11,000 cfs, respectively, while the Standard Project Flood (SPF) would discharge 59,000 cfs and 16,000 cfs, respectively. This report offers a suitable basis for the adoption of land use controls to guide flood plain development. (Coan-NC)
W79-03160

FLOOD PLAIN INFORMATION: WEST BRANCH AND FARMINGTON RIVER, CANTON, NEW HARTFORD, AND BARKHAMSTED, CT.

Army Engineer District, Waltham, MA.
May 1977, 35 p, 19 fig, 17 plates, 6 tab.

Descriptors: *Connecticut, *Flood data, *Peak discharge, Floods, Flood flow, Indirect flood measurement, Flood forecasting, Flood profiles, Historic floods, Flood frequency, Flood stages, Peak discharge, Flood peak, Stage-discharge relations, Flood plain insurance, Flood plain zoning, Warning systems, Building codes, Land use, Planning, Zoning, Control structures, Dams, Reservoirs, Still River(CT), 100-year flood, Flood plain management, Canton(CT), New Hartford(CT), Barkhamsted(CT).

The study area includes the Farmington River Basin and its West Branch, and the Still River, both near the towns of Canton, New Hartford, and

Barkhamsted, Connecticut. State park and forest recreation areas make up approximately 40% of the Farmington flood plain near Barkhamsted. Near Canton, the flood plain is primarily used for agriculture or is a wooded area. In the New Hartford area, residential, commercial, and industrial developments are extensive along the Farmington River. Flood data were obtained from U.S. Geological Survey gaging stations, maps, historic records, and interviews with local residents. Three dams designed for flood control and low flow augmentation have been constructed by the New England Corps in the Farmington River drainage basin. The worst flood on the Farmington River was recorded at the Riverton, Connecticut gaging station in August 1955 discharging 81,000 cubic feet per second (cfs) and cresting at 492.5 feet above mean sea level (msl). Torrential rains were cited as the primary cause of this flood. The greatest flood on the Still River was recorded at the Robertsville gage, reaching a peak discharge of 44,000 cfs at an elevation of 527 feet mean sea level. At the Riverton gaging station, peak flows for the 100-year flood would be 21,000 cfs cresting at 483.2 feet msl, and for the 500-year flood peak flows would be 47,000 cfs, cresting at 489 feet msl. Guidelines are presented for flood plain management. The main purpose of this report is to provide guidance for intelligent land use in the river basin. (Coan-UNC)
W79-03161

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER AND WHETSTONE BROOK, BRATTLEBORO, VT.

Army Engineer District, Waltham, MA.
Prepared for the Town of Brattleboro, VT, January 1972. 42 p, 8 fig, 15 plates, 6 tab.

Descriptors: *Vermont, *Flood profiles, *Flood data, *Peak discharge, *Flood protection, *Connecticut River(VT), Brattleboro(VT), *Whetstone Brook(VT), Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood stages, Flood peak, Stage-discharge relations, Channels, Ice jams, Non-structural alternatives, Flood plain zoning, Warning systems, Land use, Control structures, Dams, Reservoirs, Standard Project Flood, Intermediate Regional Flood.

The study area includes the Connecticut River flood plain near Brattleboro, VT, West River flood plain, and the watershed around the Whetstone Brook. Only the Whetstone Brook flood plain has any significant development consisting of residential and a small amount of commercial development. Flood data were obtained from photographs, newspaper clippings, historical records, topographic maps, and stream gage records. Flooding along the West River has been significantly reduced since 1960 by the construction of flood control structures at Ball Mountain and Townshend. Whetstone Brook is presently unregulated, and flooding can occur within this basin at any time. The combination of storage behind 5 flood-control structures and upstream from power dams reduces most flood peaks on the Connecticut River near Brattleboro to a manageable level. Flood problems along the West River arise primarily from ice jamming near the mouth of the river. The worst flood recorded on the West River occurred in September 1938 near Newfane, discharging 52,300 cubic feet per second (cfs). Flooding along Whetstone Brook results from a combination of rapid snow melt and warm rain, or by heavy rain alone. One bridge would be obstructive to major floods. The worst recorded flood along the Connecticut River occurred in March 1936, discharging 176,000 cfs. The Intermediate Regional Floods would occur as follows: on the Connecticut River near Vernon Dam discharging 140,000 cfs; on West River near its mouth discharging 30,000 cfs; and on Whetstone Brook near its mouth discharging 7,200 cfs. This report has been prepared to provide basic technical information about flood plain hazards and to serve as a basis for land use planning and management decisions concerning flood plain utilization. (Coan-NC)
W79-03162

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4A—Control Of Water On The Surface

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER, DUMMERSTON, VT.

Army Engineer District, Waltham, MA.
April 1977, 40 p, 13 fig, 17 plates, 6 tab.

Descriptors: *Vermont, *Flood profiles, *Flood data, *Peak discharge, *Connecticut River(VT), *West River(VT), Floods, Indirect flood measurement, Flood forecasting, Historic floods, Flood frequency, Flood stages, Stage-discharge relations, Rivers, Watersheds, Flood protection, Non-structural alternatives, Flood plain zoning, Flood plain insurance, Warning systems, Land use, Planning, Zoning, Control structures, Dams, Reservoirs, Dummerston(VT), 100-year flood, 500-year flood, Encroachment limits, Flood plain management.

This report presents baseline data for planning officials interested in using land use management techniques to guide flood plain development and prevent intensification of areas where other flood damage reduction techniques (such as works to modify flooding, and adjustments including flood proofing) might be used in an overall flood plain management program. The report covers the town of Dummerston, Vermont, which is subject to flooding from the Connecticut and West Rivers. Land use is primarily residential and agricultural. Flood data were obtained from three U.S. Geological Survey gaging stations, historical records, topographic maps, and weather records. Spring and fall are the major flood seasons, with flooding caused by snow melt and heavy rains. Tropical storms also cause flooding. Various flood control measures have been undertaken, including construction of 16 dams and reservoirs and enactment of various land use control measures. The greatest flood of record on the Connecticut River occurred in March 1936, discharging 176,000 cubic feet per second (cfs) and cresting at 222.9 feet above mean sea level (msl). On the West River, the largest flood occurred in 1938, discharging 52,300 cfs and cresting at 407 feet msl. More recent large floods occurred in 1960 and 1973. On the Connecticut River, the 100-year flood would discharge 132,000 cfs, and the 500-year flood, 172,000 cfs. Areas of possible future floods are shown by map, photographs, profiles, and cross-sections. A glossary of relevant terms is provided to clarify information in the report. (Coan-NC)

W79-03163

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME I: MAIN REPORT.

Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03164

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME II, APPENDIX A: THE ECONOMY AND CHARACTER OF THE MERAMEC,

Washington Univ., St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03165

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME III, APPENDIX B: WATER NEEDS AND PROBLEMS,

Washington Univ., St. Louis, MO.
For primary bibliographic entry see Field 5G.
W79-03166

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VI, APPENDICES G THROUGH L.

Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03169

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME VII, APPENDICES M THROUGH S.

Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.

W79-03170

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VIII, APPENDIX T: DETAILED COST ESTIMATES.

Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03171

COMMENTS ON ADVANCE COPY OF SUMMARY REPORT ON MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY.

Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03172

WATER RESOURCES PROJECT TYPE ACTIVITIES: CHANNEL MODIFICATION GUIDELINES.

Fish and Wildlife Service, Washington, DC. and Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03190

AN APPROACH TO THE OPTIMAL CONTROL OF POLLUTION IN BOUNDARY WATERS,

Guelph Univ. (Ontario), Dept. of Economics.
For primary bibliographic entry see Field 5G.
W79-03193

LEGAL RIGHTS IN POTOMAC WATERS, PROCEEDINGS OF A CONFERENCE AT HARPER'S FERRY, WEST VIRGINIA.

Interstate Commission on the Potomac River Basin, Bethesda, MD.
For primary bibliographic entry see Field 6E.
W79-03197

THE DEVELOPMENT OF REGIONAL IMPACT REVIEW PROCESS AND ITS APPLICATION TO GENERAL DEVELOPMENT CORPORATION'S PORT MALABAR DEVELOPMENT IN PALM BAY AND BREVARD COUNTY, FLORIDA,

Florida Univ., Gainesville, School of Law.
For primary bibliographic entry see Field 6E.
W79-03198

SUPREME COURT STRIKES NEW BALANCE IN FEDERAL-STATE TENSION OVER WESTERN WATER RIGHTS.

For primary bibliographic entry see Field 6E.
W79-03200

WATER USE PERMITS IN A RIPARIAN STATE: PROBLEMS AND PROPOSALS,

Kentucky Univ., Lexington, School of Law.
For primary bibliographic entry see Field 6E.
W79-03213

ERRONEOUSLY MEANDERED LAKESHORE: THE STATUS OF THE LAW AS IT AFFECTS TITLE AND DISTRIBUTION,

For primary bibliographic entry see Field 6E.
W79-03214

DIRECT SOLUTION TO PROBLEMS OF OPEN CHANNEL TRANSITIONS,

Roorkee Univ. (India), Dept. of Civil Engineering.
For primary bibliographic entry see Field 8B.
W79-03286

FLOOD FREQUENCY ANALYSIS BY POWER TRANSFORMATION,

Indian Inst. of Tech, New Delhi, Dept. of Civil Engineering.
For primary bibliographic entry see Field 2E.
W79-03287

METHOD OF REGULATING THE GROWTH OF AQUATIC WEEDS WITH PYRIDINE DERIVATIVES,

Lilly (Eli) and Co., Indianapolis, IN. (Assignee).
E. V. Krumkaine.
U.S. Patent No. 4,116,665, 14 p, 4 tab, 3 ref; Official Gazette of the United States Patent Office, Vol. 974, No. 4, p. 1984, September 26, 1978.

Descriptors: *Patents, *Aquatic weed control, Channel improvement, Irrigation canals, Irrigation ditches, Chemical reactions, Inhibition, *Pyridine derivatives.

A method of regulating the growth of submerged and floating aquatic weeds comprises of adding a 3-substituted pyridinemethane, pyridinemethanol, or derivative, to a body of water containing the submerged and floating aquatic weeds, in quantities sufficient to regulate the growth. The approach being taken is to limit or inhibit the amount of growth without killing the weeds. (Sinha -OEIS)
W79-03329

PRINCIPAL USES OF FRESHWATER IN FLORIDA, 1975,

Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03338

ANALYSIS OF RUNOFF FROM SMALL DRAINAGE BASINS IN WYOMING,

Geological Survey, Cheyenne, WY. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-03345

HYDROLOGIC RECONNAISSANCE OF THE FISH SPRINGS FLAT AREA, TOOKEE, JUAB, AND MILLARD COUNTIES, UTAH,

Geological Survey, Salt Lake City, UT. Water Resources Div.
E. L. Bolke, and C. T. Sumson.
Utah Department of Natural Resources, Salt Lake City, Technical Publication No 64, 1978. 30 p, 3 fig, 1 plate, 8 tab, 25 ref.

Descriptors: *Hydrologic data, *Arid climates, *Utah, *Water quality, *Available water, Surface waters, Ephemerous streams, Groundwater, Water wells, Water yield, Water utilization, Hydrologic budget, Desert basins, Western Utah.

The Fish Springs Flat area includes about 390 square miles in western Utah. Total annual precipitation on the area averages about 7 inches and totals about 232,000 acre-feet. Fish Springs Wash is the major drainage in the area; and, along with numerous smaller washes, it flows only in direct response to precipitation. Runoff from the area is estimated to be about 2,000 acre-feet per year. Ground-water recharge from precipitation is about 4,000 acre-feet annually. Ground-water discharge is chiefly by springs and evapotranspiration. The largest springs in the Fish Springs group discharge about 26,000 acre-feet annually. All other springs discharge about 600 acre-feet per year, or only about 2 percent of the total spring discharge. Discharge by evapotranspiration is about 8,000 acre-feet per year. Discharge by wells and by subsurface outflow is negligible. The difference between discharge and local recharge—approximately 31,000 acre-feet—is assumed to enter the Fish Springs Flat area by interbasin flow. The estimated amount of water recoverable from storage in the upper 100 feet of saturated valley fill is about 550,000 acre-feet; and most of this water is slightly to moderately saline. The water in the Fish Springs Flat area ranges from slightly saline to briny; and the predominant ions in the water are sodium and chloride. The water that underlies the mudflats in the northwest part of the area is briny. Water that issues from Fish Springs is slightly saline. The water in the area is not suitable for drinking. The water that issues from Fish Springs is used for wildlife management, which includes ponding and irrigation of vegetation (chiefly saltgrass) in the

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Fish Springs National, Wildlife Refuge. The water from the wells in the area is used for livestock and mining operations. (Woodard-USGS)
W79-03350

BANK-FULL DISCHARGE OF RIVERS,
Geological Survey, Denver, CO. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-03351

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1977 WATER YEAR,
Geological Survey, Little Rock, AR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03354

DESCRIPTION OF DATA-COLLECTION SYSTEM AND SYNOPSIS OF SELECTED HYDROLOGIC DATA FOR SOLDIER CREEK BASIN, KANSAS,
Geological Survey, Lawrence, KS. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03355

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1977.
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03356

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1977,
Geological Survey, Tucson, AZ. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03357

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1977.
Geological Survey, Indianapolis, IN. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03358

THE IMPENDING WATER FAMINE,
United Nations Educational, Scientific and Cultural Organization, Moscow (USSR). International Hydrological Programme.
For primary bibliographic entry see Field 6B.
W79-03435

WILL DESERTS DRINK ICEBERGS,
For primary bibliographic entry see Field 2C.
W79-03437

FROZEN GROUND PROBABILITIES USING DISCRIMINANT ANALYSIS,
Taiwan Provincial Pingtung Inst. of Agriculture, Dept. of Forestry.
For primary bibliographic entry see Field 2C.
W79-03440

4B. Groundwater Management

GRAVITY ANALYSIS OF THE SUBSURFACE STRUCTURE OF THE UPPER SANTA CRUZ VALLEY, SANTA CRUZ COUNTY, ARIZONA, Arizona Univ., Tucson. Dept. of Geosciences.
For primary bibliographic entry see Field 2F.
W79-03002

HYDROLOGIC AND CHEMICAL ANALYSES OF THE OLD TOWN AND HAMPDEN, MAINE WELL FIELDS WITH REGARD TO THE HIGH

IRON AND MANGANESE CONCENTRATION PROBLEM,
Maine Univ. at Orono. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2K.
W79-03038

REMOTE SENSING DETECTION OF PERCHED WATER TABLES, A PILOT STUDY, California Univ., Santa Barbara. Dept. of Geography.

J. E. Estes, D. S. Simonett, L. R. Tinney, C. E. Ezra, and B. Bowman.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 753, Price codes: A05 in paper copy, A01 in microfiche. Calif. Water Resources Center, Davis Tech. Compl. Rept., October 1978, Contrib No 175 ISSN 0575-4941, 8 p. 35 fig, 3 tab, 43 ref, annotated bibliography. (Calif. Water Resources Center Proj. UCAL-WRC-W-512). OWRT B-181-CAL(1).

Descriptors: *Remote sensing, *Perched water, *Infrared radiation, *Thermal radiation, Electromagnetic waves, Water table, Monitoring, Test wells, Irrigation effects.

The existence of shallow perched water tables associated with agricultural activities affects arid environments. This problem is usually related to irrigation water where percolation is impeded by a low permeable layer within the soil profile. Current methods for detection and monitoring of these tables involve test well drilling and monitoring programs that are both costly and time consuming. Remote sensing techniques have demonstrated well siting and monitoring capabilities and have potential timeliness and cost effectiveness characteristics. This study focuses upon remote sensing techniques within the spectral range 0.4 micrometer to 23 cm of the electromagnetic spectrum. Imagery from the visible and reflective infrared (aerial camera and Landsat scanner), thermal infrared (aircraft scanner) and microwave (both active L-band and passive 35 GHz micrad) region have been analyzed. Significant temporal cycles in seasonal fluctuations as well as crop growth stages play important roles in establishing the utility of sensor systems to detect vegetative response to perched water tables. A full year of Landsat data proved useful for assessing vegetative responses, however, low precipitation rates in arid regions and the masking effects of irrigation may limit its use. Results indicate that the thermal infrared region has unique detection capabilities because of differential subsurface heat flows associated with the presence of perched water tables. Temporal aspects are especially important to thermal data collection because of diurnal, seasonal and yearly dynamics of heat fluxes. (Snyder-California)
W79-03040

EVALUATION OF URBANIZATION AND CHANGES IN LAND USE ON THE WATER RESOURCES OF MOUNTAIN VALLEYS, Idaho Univ., Moscow. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4C.
W79-03042

PUBLIC GROUNDWATER SUPPLIES IN PULASKI COUNTY, Illinois State Water Survey, Urbana.

D. M. Woller, and E. W. Sanderson.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 689, Price codes: A02 in paper copy, A01 in microfiche. Bulletin 60-24, 1978, 9 p, 1 fig.

Descriptors: *Water supply, *Illinois, *Groundwater resources, *Unconsolidated aquifers, *Well data, Gravels, Sand aquifers, Bedrock, Limestones, Groundwater availability, Groundwater, Water sources, Hydrology, Water quality, Water wells, Drillers logs, Municipal water, Water yield, Water properties, Hardness(Water), Chemical properties, Deep wells, Shallow wells, Geology, Aquifers, Pulaski County(IL), Dissolved minerals, Water bearing formations.

All available information on production wells used for public groundwater supplies in Pulaski County, Illinois, was presented. The definition of public water supply is contained in the Environmental Protection Act of 1970 was used to determine those water systems and wells to be included. The report included separate descriptions for groundwater supplies of 6 municipalities. These were preceded by brief summaries of the groundwater geology of the county and the development of groundwater sources for municipal use. Individual production wells for each supply were described in the order of their construction. The description for each well included the aquifer tapped, date drilled, depth, driller, legal location, elevation in feet above mean sea level, log, construction features, yield, pumping equipment, and chemical analyses. (Humphreys-WSL)
W79-03045

FIELD INVESTIGATION OF TRACE METALS IN GROUNDWATER FROM FLY ASH DISPOSAL,

Notre Dame Univ., IN.
For primary bibliographic entry see Field 5B.
W79-03055

ALTERNATIVES FOR MANAGING A FINITE GROUNDWATER SUPPLY IN AN ARID REGION, Arizona Univ., Tucson. Office of Arid Lands Studies.

K. E. Foster.
Journal of Arid Environment, Vol. 1, No. 3, p. 275-287, 1978. 5 fig, 2 tab, 13 ref.

Descriptors: *Groundwater basins, *Alternative planning, *Water management(Applied), *Arizona, Water resources development, Water supply development, Inter-basin transfers, Water rights, Non-structural alternatives, *Santa Cruz River basin(Ariz.).

This analysis covers the water budget of Arizona in general, and of the Santa Cruz Basin in particular. The City of Tucson is used to illustrate the typical manner in which urban communities in arid regions become totally dependent upon underlying and nearby aquifers for their water. Water withdrawals from both the Avra and Santa Cruz River basins for urban, agricultural, industrial, and mining uses are shown to exceed natural aquifer replenishment by 5676 hectare meters annually. Four water resources management alternatives for reducing groundwater level decline in the Santa Cruz Basin are presented and described: (1) importing water from the Colorado River, (2) exchanging municipal sewage effluent with mines or farms for their fresh water rights, (3) interbasin transfer of water, and (4) retiring farmlands for water rights. These techniques used either singly or in combination must be based on the economic and physical characteristics of the area. It is suggested that the alternatives discussed here have application in similar arid regions throughout the world. (Tiches-Arizona)
W79-03131

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VI. APPENDICES G THROUGH L.

Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03169

STORING WATER UNDERGROUND: WHAT'S THE AQUI-FER,

Nebraska Univ., Lincoln. School of Law.
For primary bibliographic entry see Field 6E.
W79-03211

WATER AS A LOCATABLE MINERAL: THE HERESY OF THE CHARLESTONE CASE, For primary bibliographic entry see Field 6E.
W79-03212

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4B—Groundwater Management

WATER USE PERMITS IN A RIPARIAN STATE: PROBLEMS AND PROPOSALS,
Kentucky Univ., Lexington. School of Law.
For primary bibliographic entry see Field 6E.
W79-03213

INTERNATIONAL GROUNDWATER MANAGEMENT: THE CASE OF THE U.S. - MEXICAN FRONTIERS,
New Mexico Univ., Albuquerque. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-03216

THE INTERRELATIONSHIP OF GROUND AND SURFACE WATER: AN ENIGMA TO WESTERN WATER LAW,
For primary bibliographic entry see Field 6E.
W79-03222

DRAINAGE BY PARTIALLY PENETRATING RECHARGE WELLS IN A LEAKY AQUIFER,
India Inst. of Tech., Kharagpur. Dept. of Agricultural Engineering.
For primary bibliographic entry see Field 2F.
W79-03278

A METHOD FOR THE ANALYSIS OF DRAWDOWN FROM MULTIPLE-SOURCE TEST PUMPING,
Southern Water Authority, Eastleigh (England).
Directorate of Resource Planning.
T. Keating.
Journal of Hydrology, Vol. 39, No. 1/2, p 185-191, October 1978. 2 fig, 1 tab, 5 ref.

Descriptors: *Drawdown, *Pump testing, Analysis, *Least squares method, Transmissivity, Storage coefficient, Aquifer characteristics, Observation wells, Equations, Theoretical analysis, On-site data collections, Wells, Pumping, Computer models, *Multiple-source pumping test.

Presented herein was a method for the computation of transmissivity and storativity from drawdown data measured in an observation well during a multiple-source test pumping in an isotropic homogeneous nonleaky aquifer. The method uses the principle of least squares to obtain the best fit between the observed and predicted drawdowns. A field example was used to illustrate the application of the method. (Visocky-ISWS)
W79-03283

BROMACIL IN LAKELAND SOIL GROUND WATER,
Southeastern Forest Experiment Station, Marion, FL.
For primary bibliographic entry see Field 5B.
W79-03291

WASTEWATER REUSE BY BIOLOGICAL-CHEMICAL TREATMENT AND GROUND-WATER RECHARGE,
Water Planning for Israel Ltd., Tel-Aviv. Dept. of Sewage Reclamation.
For primary bibliographic entry see Field 5D.
W79-03305

A HYDROLOGIC STUDY OF WATER WELL YIELDS AND GROUNDWATER QUALITY RELATED TO STRATIGRAPHIC AND STRUCTURAL SETTINGS IN WESTERN JACKSON COUNTY, WEST VIRGINIA,
West Virginia Univ., Morgantown. Dept. of Geology and Geography.
For primary bibliographic entry see Field 5A.
W79-03306

PREDICTED TRACE METAL CONCENTRATIONS IN SAINÉ SEEP WATERS,
Montana State Univ., Bozeman. Dept. of Chemistry.
For primary bibliographic entry see Field 5B.
W79-03309

INFILTRATION FROM TRIBUTARY STREAMS IN THE SUSQUEHANNA RIVER BASIN, NEW YORK,
Geological Survey, Albany, NY. Water Resources Div.

For primary bibliographic entry see Field 2F.
W79-03335

GROUND-WATER RESOURCES OF THE CAPE LOOKOUT NATIONAL SEASHORE, NORTH CAROLINA,
Geological Survey, Raleigh, NC. Water Resources Div.

For primary bibliographic entry see Field 2L.
W79-03337

WARM SPRINGS, SOUTH ISLAND, NEW ZEALAND, AND THEIR POTENTIALS TO YIELD LAUMONITE,

Geological Survey, Menlo Park, CA. Water Resources Div.; and Department of Scientific and Industrial Research, Petone (New Zealand). Chemistry Div.

For primary bibliographic entry see Field 2K.
W79-03340

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE SANDSTONE AQUIFER, WISCONSIN,

Geological Survey, Madison, WI. Water Resources Div.

For primary bibliographic entry see Field 7C.
W79-03341

INFLATABLE STRADDLE PACKERS AND ASSOCIATED EQUIPMENT FOR HYDRAULIC FRACTURING AND HYDROLOGIC TESTING,
Geological Survey, Denver, CO. Water Resources Div.

For primary bibliographic entry see Field 7B.
W79-03342

THE HYDROTHERMAL SYSTEM OF LONG VALLEY CALDERA, CALIFORNIA,

Geological Survey, Menlo Park, CA. Water Resources Div.

M. L. Sorey, R. E. Lewis, and F. H. Olmsted.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price \$2.50. Professional Paper 1044-A, 1978. 60 p., 34 fig, 1 plate, 17 tab, 112 ref.

Descriptors: *Geothermal studies, *California, *Model studies, *Heat flow, *Thermal water, Water temperature, Mathematical models, Numerical analysis, Hydrologic properties, Geochemistry, Aquifer characteristics, Hot springs, Depth, Test wells, Evaluation, *Long Valley caldera(Calif), Groundwater reservoir.

Results of previous investigations by the U.S. Geological Survey and limited information from a recently drilled 2.11-km-deep test hole in Long Valley caldera, California, enable a useful conceptual model of the hydrothermal system to be developed. The results obtained from numerical simulations with this model permit a useful determination of a general relation between heat flow and the depth and duration of fluid flow, as well as the effective hydraulic characteristics of the hydrothermal reservoir. The conceptual model is based largely on the following information from previous studies. Seismic-refraction experiments and geological investigations delineate three major rock units: (1) a near-surface layer of low velocity, largely nonindurated sediments and volcanic rocks, (2) an underlying, continuous layer of densely welded Bishop Tuff, and (3) precaldera granitic and metamorphic basement rocks below depths of 2.5 to 3.0 km. Regional heat-flow, seismic-refraction, and telesismic analyses, and the recent occurrence of extrusive volcanism suggest that magma or partially molten rock exists under the western three-fifths of the caldera at depths of 6 to 8 km. The present-day hydrothermal system is dominated by hot water with aquifer temperatures at depth, estimated from the geochemistry of hot-

spring waters, of about 210 to 280 degrees C. (Woodard-USGS)
W79-03343

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCE-MID-ATLANTIC REGION,
Geological Survey, Reston, VA. Water Resources Div.

A. Sinnott, and E. M. Cushing.

Available from Supt. of Documents, GPO, Washington, DC 20402, Price \$1.60. Professional Paper 813-I, 1978. 32 p., 10 fig, 2 tab, 105 ref.

Descriptors: *Groundwater resources, *Regional analysis, *Aquifer management, *Water supply, Groundwater availability, Water quality, Aquifer characteristics, Withdrawal, Water yield, Groundwater recharge, Water storage, Water resources development, Projections, Atlantic Coastal Plain, *Mid-Atlantic Region, Hudson River basin, Susquehanna River basin, Potomac River basin, Delaware River basin, James River basin.

The Mid-Atlantic Region covers a total area of about 108,000 square miles. It includes parts of Vermont, Massachusetts, New York, Pennsylvania, Maryland, West Virginia, and Virginia, the entire States of New Jersey and Delaware, and the District of Columbia. It encompasses the entire drainage basins (within the United States), the Hudson, Delaware, Susquehanna, Potomac, and the James River and includes Long Island and the coastal drainage of New Jersey, Delaware, Maryland, and Virginia. Ground water is derived primarily from precipitation. The natural discharge from the aquifers in the region is estimated to be at about 38.6 billion gallons per day; in addition, at least 140-350 billion gallons is stored in the aquifers. About 949 billion gallons of fresh ground water was withdrawn in 1970. This quantity represents about 9 percent of the total freshwater use of 10,220 billion gallons. Available ground-water reserves indicate that a considerable part of the additional supplies needed for the anticipated increase in economic activity in the region could be developed from ground water. (Woodard-USGS)
W79-03344

PREDICTED WATER-LEVEL AND WATER-QUALITY EFFECTS OF ARTIFICIAL RECHARGE IN THE UPPER COACHELLA VALLEY, CALIFORNIA, USING A FINITE-ELEMENT DIGITAL MODEL,

Geological Survey, Menlo Park CA. Water Resources Div.

L. A. Swain.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 551, A04 in printed copy, A01 in microfiche. Water-Resources Investigations 77-29, April 1978. 54 p., 33 fig, 9 tab, 11 ref.

Descriptors: *Artificial recharge, *Water levels, *Water quality, *Groundwater resources, *Forecasting, Groundwater movement, Model studies, Finite element analysis, Aquifer management, Water supply, Water demand, *California, *Coachella Valley(Calif).

From 1936 to 1974, water levels declined more than 100 feet in the Palm Springs area and 60 feet in the Palm Desert area of the upper Coachella Valley, Calif. Water from the Colorado River Aqueduct is presently being recharged to the basin. The dissolved-solid concentration of native ground water in the recharge area is about 210 mg/liter and that of recharge water ranges from 600 to 750 mg/liter. A finite-element model indicates that without recharge the 1974 water level in the Palm Springs area will decline 200 feet by the year 2000 because of pumping. If the aquifer is recharged at a rate from about 7,500 acre-feet per year in 1973 increasing to 61,200 acre-feet per year in 1990 and thereafter, the water level in the Palm Springs area will decline about 20 feet below the 1974 level by 1991 and recover to the 1974 level by 2000. The solute-transport finite-element model of the recharge area indicates that the artificial recharge plume (bounded by the 300-mg/liter line)

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will move about 1.1 miles downgradient of the recharge ponds by 1981 and about 4.5 miles from the ponds by 2000. (Woodard-USGS)
W79-03346

WELL-RESPONSE MODEL OF THE CONFINED AREA, BUNKER HILL GROUND-WATER BASIN, SAN BERNARDINO COUNTY, CALIFORNIA.

Geological Survey, Menlo Park, CA. Water Resources Div.

T. J. Durbin, and C. O. Morgan.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 515, A03 in printed copy, A01 in microfiche. Water-Resources Investigations 77-129, July 1978. 39 p, 20 fig, 8 tab, 15 ref.

Descriptors: *Groundwater recharge, *Natural recharge, *Artificial recharge, *Model studies, *Potentiometric level, Forecasting, Confined water, Aquifer management, Mathematical models, Computer models, Analytical techniques, *California, *Bunker Hill ground-water basin(Calif), San Bernardino County, Well-response model.

The Bunker Hill ground-water basin, in the vicinity of San Bernardino, Calif., is being artificially recharged with imported water. Current and future artificial recharge of the basin may cause the potentiometric surface in an area of confined ground water to rise above land surface and water to flow from uncapped and unplugged wells. This could cause damage to structures where the soil becomes waterlogged and where buried wells begin to flow beneath the structures. A well-response model was used to generate a series of water-level hydrographs representing the response of the ground-water basin to six possible combinations of conditions for each well; one pumping rate, two artificial-recharge rate, and three natural-recharge rates. Inflow to the ground-water basin exceeds outflow for all tested combinations. According to model predictions, the accumulation of stored ground water resulting from the excess of inflow is sufficient to cause the water level in the selected wells to rise above land surface for all but one of the combinations of conditions tested. Water levels in wells are predicted to rise above the land surface as early as 1981 for the combination with the greatest excess of inflow. (Woodard-USGS)

W79-03347

HYDROLOGIC RECONNAISSANCE OF THE FISH SPRINGS FLAT AREA, TOOELE, JUAB, AND MILLARD COUNTIES, UTAH.

Geological Survey, Salt Lake City, UT. Water Resources Div.

For primary bibliographic entry see Field 4A.

W79-03350

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, FEBRUARY 1975 - SEPTEMBER 1977.

Geological Survey, San Antonio, TX. Water Resources Div.

For primary bibliographic entry see Field 5A.

W79-03353

DESCRIPTION OF DATA-COLLECTION SYSTEM AND SYNOPSIS OF SELECTED HYDROLOGIC DATA FOR SOLDIER CREEK BASIN, KANSAS.

Geological Survey, Lawrence, KS. Water Resources Div.

For primary bibliographic entry see Field 7C.

W79-03355

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1977.

Geological Survey, Salt Lake City, UT. Water Resources Div.

For primary bibliographic entry see Field 7C.

W79-03356

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1977.

Geological Survey, Tucson, AZ. Water Resources Div.

For primary bibliographic entry see Field 7C.
W79-03357

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1977.

Geological Survey, Indianapolis, IN. Water Resources Div.

For primary bibliographic entry see Field 7C.
W79-03358

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS.

Rhode Island Univ., Kingston. Dept. of Geology.

For primary bibliographic entry see Field 2F.

W79-03417

4C. Effects On Water Of Man's Non-Water Activities

EVALUATION OF URBANIZATION AND CHANGES IN LAND USE ON THE WATER RESOURCES OF MOUNTAIN VALLEYS,

Idaho Univ., Moscow. Dept. of Civil Engineering. C. E. Brockway, and K. P. Grover.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 735, Price codes: A07 in paper copy, A01 in microfiche. Idaho Water Resources Research Institute, University of Idaho Research Technical Completion Report, October 1978. 113 p, 42 fig, 7 tab, 10 ref, append. OWRT B-038-IDR(1), 14-34-0001-6701.

Descriptors: *Groundwater models, Aquifers, *Silver Creek-Big Woods(Ida), Model studies, *Idaho, *Land use, *Urbanization, Evaluation, Streams.

Impact of projected changes in land use on aquifer and stream systems of the Big Wood River-Silver Creek area, S. Idaho was evaluated using, finite difference model of the groundwater system. Water table and confined aquifers were simulated. Simulated groundwater levels and spring flows were determined for projected changes in land use. Severe decreases up to 38% in discharge of Silver Creek, a productive spring fed trout stream were projected. Groundwater levels in water table and artesian aquifers could decline up to 16 feet. Most severe impacts will result from conversion of present flood end furrow irrigated land to sprinkler irrigation with attendant decrease in aquifer recharge. 1977 drought, during which irrigation diversions were 28% of 1975 diversions, was simulated and compared with measured data. Reasonable comparisons of simulated and measured groundwater levels and spring flows support the validity of the model as a planning tool.

W79-03042

UTILITY LINE SITING AND WETLAND PRESERVATION,

Wisconsin Univ. Madison. Land Resources.

E. Quigley.

PhD Dissertation, May 1977. 210 p, 29 fig, 19 tab,

293 ref, 7 append.

Descriptors: *Wetlands, *Electrical networks, Utilities, Transmission lines, Transmission towers, Aesthetics, Vegetation effects.

Over 70% of the utility lines passing through wetlands parallel other linear land uses in wetlands, primarily roads or railroads; however, only 30% of the lines were immediately adjacent to the road or railroad, resulting in parallel corridors of impact. The most obvious impacts from the lines are that shrubs and trees are cut, and that transmission towers and lines are visible. At some sites, utility lines have significant impact on wetland hydrology and vegetation. Other potential significant impacts

include impacts on waterfowl, and microclimatic and radiation impacts. (Steiner-Mass)
W79-03090

ANTHROPOGENIC IMPACT ON THE ALBEDO OF THE EARTH,

Tel-Aviv Univ. (Israel). Dept. of Geophysics and Planetary Sciences.

For primary bibliographic entry see Field 2B.

W79-03134

ECOLOGY AND ENVIRONMENT IN THE UNITED ARAB EMIRATES,

Nature Conservancy, Grange-over-Sands (England). Merlewood Research Station.

J. E. Satchell.

Journal of Arid Environments, Vol. 1, No. 3, p. 201-226, 1978. 7 fig, 4 plates, 86 refs.

Descriptors: *United Arab Emirates, *Deserts, *Ecology, *Data collections, *Salinity, *Irrigation effects, Environmental effects, Desalination, Grazing, Research and development.

Although the United Arab Emirates are world leaders in per capita gross national product, ecological information relevant to the area's natural habitat and the environmental effects of its industrial revolution are scarce or non-existent. This paper attempts to gather together information known concerning its climate, physiography, soils, water, agriculture, indigenous vegetation, terrestrial and marine fauna (including lists of species present), and settlement patterns. Since few crops other than dates can be grown without irrigation, several hundred bore holes have been drilled and sea water desalination plants constructed mainly for the benefit of coastal towns. Salinity problems have plagued many irrigation projects, attributable to salt water intrusion from the Gulf, highly mineralized groundwater, and over use of irrigation water, although here, as with other data, incomplete information precludes absolutes. From this extensive review of what is known about the area, this author cites the following as areas in which ecological research is needed: (1) destructive effects of desert settlement, (2) overstocking as a result of increased fodder production, (3) increased populations of wildlife reservoirs of vector-borne diseases as a result of irrigation and afforestation, (4) depletion of wildlife resources, particularly that caused by coastal development, and (5) effects of marine and atmospheric pollution by coastal industry. (Ticek-Arizona)
W79-03137

BIBLIOGRAPHY OF THE GEOLOGY AND HYDROLOGY OF THE ALBUQUERQUE GREATER URBAN AREA, BERNALILLO AND PARTS OF SANDOVAL, SANTA FE, SOCORRO, TORRANCE, AND VALENCIA COUNTIES, NEW MEXICO,

Geological Survey, Albuquerque, NM. Water Resources Div.

For primary bibliographic entry see Field 10C.

W79-03339

URBAN STORM-WATER-QUALITY DATA, PORTLAND, OREGON, AND VICINITY,

Geological Survey, Portland, OR. Water Resources Div.

For primary bibliographic entry see Field 7C.

W79-03349

HYDROLOGIC AND GEOMORPHIC DATA FROM THE PICEANCE BASIN, COLORADO, 1972-77,

Geological Survey, Denver, CO. Water Resources Div.

For primary bibliographic entry see Field 7C.

W79-03359

HARVESTING EFFECTS ON SOIL AND WATER IN THE EASTERN HARDWOOD FOREST,

Northeastern Forest Experiment Station, Parsons,

Field 4—WATER QUANTITY MANAGEMENT AND CONTROL

Group 4C—Effects On Water Of Man's Non-Water Activities

WV. Timber and Watershed Lab.

J. H. Patric.

Southern Journal of Applied Forestry, Vol. 2, No. 3, p. 66-73, August 1978. 7 illus.

Descriptors: *Lumbering, *Forest watersheds, *Forest soils, *Soil erosion, *Water quality, Hardwood, United States, Roads, Road design, Forest fires, Evaporation, Flooding, Nutrients, Fertilizers, Water pollution sources, Water pollution, Water temperature, Water pollution effects.

Soil erosion is a normal geologic process that is accelerated modestly and briefly by logging, even with careful practices. Overland flow seldom occurs in the carefully managed forest; its occurrence on logging roads is a common, though preventable, cause of accelerated erosion. It has not been shown that conventional logging practices decrease soil productivity. Careless logging and road building, especially near stream channels, can accelerate soil erosion substantially. Fire may modestly and briefly accelerate soil erosion. Tree cutting reduces evaporative losses with corresponding gains in stream volume. Logging in scattered blocks has negligible effects on river flooding. Logging temporarily accelerates the release of nutrients from the forest floor, causing some enrichment of streams. Fertilization also enriches streams temporarily. Channel clearing increases water temperature until regrowth restores shading. (Witt-IIPC)

W79-03412

HYDROLOGIC IMPACT OF GRAZING ON INFILTRATION: A CRITICAL REVIEW,
Utah State Univ., Logan. Watershed Science Unit.
G. F. Gifford, and R. H. Hawkins.
Water Resources Research, Vol. 14, No. 2, p. 305-313, April, 1978. 5 fig, 4 tab, 37 ref.

Descriptors: *Grazing, *Infiltration, *Infiltration rates, Hydrologic aspects, *Reviews, Ranges, Runoff, Hydrographs, Water yield, Range management.

The hydrologic importance of grazing is receiving increased attention on rangelands in the United States. The literature on this topic is fragmented. This paper explores the available literature for information useful in understanding the hydrologic impacts of grazing intensity as related primarily to infiltration and runoff. Generally, data relative to range condition are not adequate for evaluating hydrologic impacts. Data relating grazing intensity to infiltration rates are available, yet distinct limitations are evident. These limitations are discussed in terms of identifying future research needs. The greatest need appears to be a detailed definition of the long-term effects of grazing (by year and season) on infiltration rates as a function of site, range condition, and grazing intensity. Once obtained, infiltration rates must be coupled with an appropriate method for generating runoff volumes, storm hydrographs, and long-term water yields. (Skogerboe-Colorado State)

W79-03416

A PRECARIOUS BALANCE UPSET,
For primary bibliographic entry see Field 2A.
W79-03432

THE SANDS OF WRATH: AMERICA'S DUST BOWL IN RETROSPECT,
Texas Tech Univ., Lubbock.
H. E. Dregne.
UNESCO Courier, July 1977, p 14-17, 3 fig.

Descriptors: *Desertification, *History, *Salinity, *Drainage, *Grazing, *Erosion, Saturated soils, Land use, Irrigation practices, Ecosystems, Arid lands, Water management(Applied).

Three instances of widespread desertification in the U.S. are reviewed to identify and illustrate the nature of arid ecosystems and their low resilience after disturbance. The most recent of these catastrophic events occurred in the semiarid southern Great Plains, an area which came to be known as

the dust bowl. A long period of improper management stemming from a lack of understanding or experience in arid regions created land erosion so great that a dust pall spread over the humid eastern U.S. and over the Atlantic. The second case of widespread desertification reviewed here began with the rapid settlement of the arid west in the second half of the 19th century. Increasing numbers of grazing cattle and sheep turned grasslands into arid rangeland by the beginning of the 20th century. Natural reestablishment of a grass cover is difficult under such circumstances, although a general awareness of the problem since 1910 has precipitated productive research on range management that is just now showing benefits. The third instance of desertification discussed here is associated with the rapid expansion of irrigation in the west since the end of the 19th century that has produced waterlogging and salinization problems. Poorly drained soils were heavily irrigated because they occupied low-lying level areas easy to irrigate. Lack of prior knowledge or experience with salinization or waterlogging hazards created large tracks of unproductive land difficult to reclaim. This author presents this analysis to illustrate how signs of desertification can be recognized and corrective measures taken before massive destruction takes its toll again. (Tockes-Arizona)

W79-03434

ARE DESERTS MAN-MADE,

Cairo Univ., Giza (Egypt).

For primary bibliographic entry see Field 2B.

W79-03436

4D. Watershed Protection

A PARAMETRIC MODEL CALIBRATED WITH A PHYSICALLY BASED MODEL FOR RUNOFF PREDICTION FROM UNGAGED STREAMS,
Arizona Univ., Tucson. Dept. of Hydrology and Water Resources.

For primary bibliographic entry see Field 2A.
W79-03003

STANDARDS RELATED TO WATER-ORIENTED AND WATER-ENHANCED RECREATION IN WATERSHEDS - PHASES II AND III,

Pennsylvania State Univ., University Park. Coll. of Health, Physical Education, and Recreation.

For primary bibliographic entry see Field 6B.

W79-03004

AN ASSESSMENT OF THE EFFECTS OF STORMWATER RUNOFF FROM URBAN WATERSHEDS ON THE WATER QUALITY OF A RECEIVING RESERVOIR,
Tennessee Univ., Knoxville.

For primary bibliographic entry see Field 5C.
W79-03005

SOIL EROSION CONTROL ON CONSTRUCTION SITES WITH PORTLAND CEMENT,
Science and Education Administration, Oxford, MS. Sedimentation Lab.

M. J. M. Romkens, C. B. Johnson, and D. W. Nelson.

Journal of Soil and Water Conservation, Vol 33, No 5, p 232-235, September 1978. 2 fig, 2 tab, 9 ref.

Descriptors: *Portland cements, *Erosion, *Construction, Soils, Erosion control, Erosion rates, Cements, Soil erosion, Vegetation, Rainfall simulators, Vegetable-cover, Chemical stabilizers.

Simulated rainfall was used to determine the erosion control effects of portland cement on upland soils. Treatments included 4 rates of cement application and 2 methods of cement incorporation on 2 medium-textured soils. The application of 2.50 metric tons of portland cement per hectare (1.1 tons/acre), applied as a suspension on a tilted slope of moderate steepness and length, nearly eliminated soil erosion. Lower rates of cement application proved ineffective in controlling soil erosion, while

higher application rates resulted in adverse effects on the establishment of vegetative cover. Incorporation of cement into the top 2.5 cm (1 inch) of soil at the 2.50-metric-ton-per-hectare rate proved ineffective for soil erosion control. (Lee-ISWS)

W79-03058

CALCULATED SNOWPACK EVAPORATION DURING CHINOOKS ALONG THE EASTERN SLOPES OF THE ROCKY MOUNTAINS IN ALBERTA,

Northern Forest Research Center, Edmonton (Alberta).

For primary bibliographic entry see Field 2D.
W79-03274

TRADE-OFFS BETWEEN EROSION CONTROL AND PRODUCTION COSTS IN U.S. AGRICULTURE,

Iowa State Univ., Ames. Center for Agricultural and Rural Development.

E. O. Heady, and G. F. Vocke.
Journal of Soil and Water Conservation, Vol. 33, No. 5, p 227-230, September-October 1978. 3 fig, 4 tab, 8 ref.

Descriptors: *Erosion control, *Agriculture, *Farm management, *Costs, Economics, Economic justification, Model studies, Mathematical models, Crops, Crop production, Soils, Soil erosion, Analytical techniques, Tillage practices, Soil losses.

Trade-offs between erosion control and production costs were estimated for the nation and 105 producing regions. This analysis employed a linear programming model in which values were placed both on soil loss and production costs. The trade-off curve derived showed that, nationally, annual soil loss can be reduced from an average of 5.56 to 2.50 tons per acre with only slight increases in production costs. A further reduction to 1.98 tons per acre, however, entails much greater cost increases. Land values and commodity prices follow similar patterns. (Sims-ISWS)

W79-03284

PLANT INDICATORS OF SLOPE INSTABILITY,

Washington State Univ., Pullman. Dept. of Forest and Range Management.

M. W. Pole, and D. R. Satterlund.
Journal of Soil and Water Conservation, Vol. 33, No. 5, p. 230-232, September-October 1978. 2 tab, 13 ref.

Descriptors: *Slope stability, *Vegetation, *Forests, Plant groupings, Ferns, Shrubs, Landslides, Erosion, Rockslides, Mudflows, Sediments, Soil erosion, Slopes, Geology, Erosion control, *Plant indicators.

Mass movement on disturbed, unstable slopes not only reduces productivity, but also is a major source of sediment in wildland areas. Prevention requires the disturbance be avoided on sites with high potential for mass movement, which, in turn, requires that such areas be readily identifiable. Understory plant indicators proved useful in identifying 60% of the sites showing evidence of deep-seated mass movement, such as rotational slumps and earth-flows, in Idaho's Clearwater National Forest. The ecological characteristics of plants that proved to be the most useful indicators suggest that ecologically analogous species might be used to identify many similar sites in other regions. (Sims-ISWS)

W79-03285

ECONOMICS OF MINED LAND RECLAMATION AND LAND-USE PLANNING IN WESTERN STATES,

Argonne National Lab, IL.
For primary bibliographic entry see Field 6B.
W79-03433

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

5. WATER QUALITY MANAGEMENT AND PROTECTION

5A. Identification Of Pollutants

AN ASSESSMENT OF THE EFFECTS OF STORMWATER RUNOFF FROM URBAN WATERSHEDS ON THE WATER QUALITY OF A RECEIVING RESERVOIR, Tennessee Univ., Knoxville. For primary bibliographic entry see Field 5C. W79-03005

SIGNIFICANCE OF TURBIDITY FOR QUALITY ASSESSMENT OF AGRICULTURAL RUNOFF AND IRRIGATION RETURN FLOW, Washington State Univ., Pullman. Dept. of Agricultural Engineering.

L. G. King, D. L. Bassett, and J. M. Ebeling. Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 730, Price codes: A04 in paper copy, A01 in microfiche. State of Washington Water Research Center, Washington State University Project Completion Report, 1978. 68 p, 12 fig, 9 tab, 26 ref, 4 append. OWRT A-091-WASH(1). 14-34-0001-7102.

Descriptors: *Sediments, *Turbidity, Water quality, Runoff, *Irrigation return flow, Erosion, Surface irrigation, *Agricultural runoff, Water pollution sources.

Turbidity and suspended sediment concentration were measured for both agricultural runoff and irrigation return flow. Extensive statistical analysis showed only minimal correlation. Mic scattering theory was explored to determine the significance of such factors as particle size, index of refraction, concentration and angle of scatter for both the nephelometer and the transmissometer. It was found that only particles of less than ten microns in diameter contribute significantly to the measurement of turbidity. Direct measurement of suspended sediment for agricultural runoff and irrigation return flow is recommended. W79-03006

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES: GASIFICATION: SECTION 5. BI-GAS PROCESSES,

Exxon Research and Engineering Co., Linden, NJ. For primary bibliographic entry see Field 5G. W79-03019

DADE COUNTY INDUSTRIAL WASTE SOURCES, INVENTORY AND EVALUATION, National Field Investigations Center-Denver, CO. For primary bibliographic entry see Field 5B. W79-03030

CITRIC ACID ENHANCEMENT OF COPPER SULFATE TOXICITY TO THE BLUE-GREEN ALGAE APHANIZOMENON FLOS-AQUAE AND MICROCYSTIS AERUGINOSA, Missouri Univ.-Kansas City. Dept. of Biology. For primary bibliographic entry see Field 5C. W79-03037

HYDROLOGIC AND CHEMICAL ANALYSES OF THE OLD TOWN AND HAMPDEN, MAINE WELL FIELDS WITH REGARD TO THE HIGH IRON AND MANGANESE CONCENTRATION PROBLEM,

Maine Univ. at Orono. Dept. of Civil Engineering. For primary bibliographic entry see Field 2K. W79-03038

AN AUTOMATED DETERMINATION OF LOW REACTIVE PHOSPHORUS CONCENTRATIONS IN NATURAL WATERS IN THE PRE-

ENCE OF ARSENIC, SILICON AND MERCURIC CHLORIDE,

Department of Scientific and Industrial Research, Taupo (New Zealand), Ecology Div.

M. T. Downes. Water Research, Vol 12, No 10, p 743-745, 1978. 2 fig, 1 tab, 12 ref.

Descriptors: *Phosphorus, *Chemical analysis, *Analytical techniques, Lakes, *Arsenic, *Silicon, Mercury, Chemical reactions, Water pollution, Pollutants, Pollutant identification, Herbicides, Chemistry, Water chemistry, *Mercuric chloride, Chemical interference.

An automated technique for reactive phosphorus, sensitive to less than 0.5 mg P/cu m, was described. Interference from AsO₄(3-)As and mercuric chloride was removed by thiosulphite in acid solution. The interference from 100 mg AsO₄(3-)As/cu m, 10 g/cu m molybdate-reactive silicon or 60 g/cu mercuric chloride was equivalent to less than 0.5 mg P/cu m. (Sims-ISWS) W79-03047

CHEMICAL COMPOSITION OF ACID PRECIPITATION IN PASADENA, CALIF., California Inst. of Tech., Pasadena. Dept. of Environmental Engineering Science.

H. M. Liljestrand, and J. J. Morgan. Environmental Science and Technology, Vol 12, No 12, p 1271-1273, November 1978. 1 fig, 2 tab, 16 ref.

Descriptors: *Precipitation(Atmospheric), *Acids, *California, *Chemicals, Rainfall, Sampling, Chemical analysis, Cations, Anions, Ions, Hydrogen ion concentration, Analytical techniques, Model studies, Mathematical models, Water pollution, Water pollution sources, Pollutants, Pollutant identification, *Pasadena(CA), Acid precipitation, *Acid rainfall.

Wet-precipitation-only samplers were used to collect acid rainfall in Pasadena, California, from February 1976 to September 1977. The concentrations of the major cations (H⁺, NH₄⁺, K⁺, Ca²⁺, and Mg²⁺) and the major anions (Cl⁻, NO₃⁻, SO₄²⁻) were determined. The relative importance of different sources was calculated by a chemical balance. The volume weighted mean pH was 4.06, with nitric acid being 32% more important than sulfuric acid. The pH was controlled by the interaction of bases and strong acids. (Sims-ISWS) W79-03054

FIELD INVESTIGATION OF TRACE METALS IN GROUNDWATER FROM FLY ASH DISPOSAL,

Northeast Univ., IN. For primary bibliographic entry see Field 5B. W79-03055

TEMPORAL VARIATIONS AND PROBABLE ORIGINS OF HYDROCARBONS IN THE WATER COLUMN OF BEDFORD BASIN, NOVA SCOTIA, Bedford Inst. of Oceanography, Dartmouth (Nova Scotia). Marine Ecology Lab. For primary bibliographic entry see Field 2L. W79-03062

FATE OF HERBICIDES CNP IN RIVERS AND AGRICULTURAL DRAINAGES,

Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan). For primary bibliographic entry see Field 5B. W79-03065

A COMPARISON OF DISCRETE AND INTENSIVE SAMPLING FOR MEASURING THE LOADS OF NITROGEN AND PHOSPHORUS IN THE RIVER MAIN, COUNTY ANTRIM, Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit. R. J. Stevens, and R. V. Smith.

Water Research, Vol 12, No 10, p 823-830, 1978. 4 fig, 9 tab, 26 ref.

Descriptors: *Sampling, *Phosphorus, *Nitrogen, *River flow, Nutrients, Water quality, On-site data collections, Rivers, Pollutants, *Pollutant identification, Chemical analysis, Data processing, Statistical models, Water sampling, Water pollution, Fertilizers, *River Main(Northern Ireland), Sampling frequency.

The River Main, County Antrim, was intensively monitored during November 1974 to May 1975 to obtain accurate measurements of the loads of nitrogen and phosphorus to compare with loads predicted by a statistical model from discrete sampling and continuous flow data. During the survey period, 2-hourly samples were collected on 102 days. Flow data were available from continuous recording of river level. Depending on the prevailing flow conditions, 2-hourly or composite 8-hourly samples were analyzed for soluble reactive P, soluble unreactive P, total soluble P, particulate P, total P, nitrate N, Kjeldahl N, and total N. For the discrete sampling program, grab samples were collected at 8-day intervals and analyzed for soluble reactive P, total P, and nitrate N. River flow data showed the 'flashy' nature of the discharge and flow variation by two orders of magnitude. During intensive monitoring, particulate P concentration varied by two orders of magnitude, while all other fractions varied by about one order of magnitude. Therefore, flow was more important in determining loads for all fractions except particulate P. The concentration of all fractions, except soluble unreactive P, were related significantly to flow. Loads and flows generally were related best by log load-log flow equations. The slopes of these equations indicated that soluble reactive P and nitrate N sources were diluted by low concentration water at high flows, whereas particulate P sources increased at high flows due to erosion and surface run-off. (Sims-ISWS) W79-03066

ACTINIDE ACTIVITIES IN WATER ENTERING THE NORTHERN NORTH SEA, Deutsches Hydrographisches Inst., Hamburg (Germany, F.R.). Lab. Sulidorf. C. N. Murray, H. Kautsky, M. Hoppenheit, and M. Domian. Nature, Vol 276, No 5685, p 225-230, November 16, 1978. 5 fig, 18 ref.

Descriptors: *Pollutants, *Radioisotopes, *Sampling, *Oceans, Water pollution, Cesium, Surveys, On-site data collections, Laboratory tests, Analytical techniques, Path of pollutants, Pollutant identification, *North Sea, Plutonium, Americium, *Actinides.

Surface seawater measurements of 239+240 Pu, 238 Pu, 241 Am and 137 Cs have been carried out in the North Sea and western Atlantic. Statistical analysis demonstrated that the discharges by fuel reprocessing plants in the UK are affecting plutonium activities in these sea areas. A difference in behavior of americium to plutonium was also observed. (Sims-ISWS) W79-03067

RECENT DEVELOPMENTS IN ATMOSPHERIC CHEMISTRY,

Cambridge Univ. (England). Dept. of Physical Chemistry. For primary bibliographic entry see Field 2K. W79-03072

PREDICTING TEMPERATURE TREND IN THE NORTHERN HEMISPHERE TO THE YEAR 2000, British Meteorological Office, Bracknell (England).

For primary bibliographic entry see Field 2B. W79-03075

ARSENIC STABILITY IN CONTAMINATED SOILS,

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

Missouri Univ.-Columbia. Dept. of Agronomy. R. E. Hess, and R. W. Blanchard. Soil Science Society of America Journal Vol 40, No. 6, p 847-852 November-December 1976 1 fig, 3 tab, 19 ref.

Descriptors: *Arsenates, Sampling, Soil analysis, Aluminum arsenate, Iron arsenate, Calcium arsenate, Manganese arsenate, Lead arsenate, Manganese oxides, *Pollutant identification, *Missouri, *Arsenic compounds.

Various Al, Ca, Fe, Mn, and Pb arsenate compounds were formed and their solubility products determined. The amount of arsenate in solution for each of the compounds could be predicted as follows: $\text{AlAsO}_4 \cdot 2\text{H}_2\text{O}$ or $\text{Fe}(\text{OH})_3$, FeAsO_4 , $2\text{H}_2\text{O}$ or $\text{Fe}(\text{OH})_3$, $\text{FeAsO}_4(\text{pAsO}_4 = 26.07-3\text{pH})$, $\text{Ca}_3(\text{AsO}_4)_2 \cdot 14\text{H}_2\text{O}$ ($\text{pAsO}_4 = 9.29-1.5\text{pCa}$), $\text{Pb}_3(\text{AsO}_4)_2 \cdot 4\text{H}_2\text{O}$ ($\text{pAsO}_4 = 19.75-1.5\text{pPb}$), and $\text{Mn}_3(\text{AsO}_4)_2$ ($\text{pAsO}_4 = 35.6-12.8\text{Eh}-2.3\text{pH}$), or ($\text{pAsO}_4 = 47.3-25.3\text{Eh}-3\text{pH}$), with either Mn_2O_3 or MnO_2 . Samples from Sharpsburg and Menfro soils were equilibrated for 7 days at 25 degree C with dilute HCl and NaOH. Aluminum, Fe, Ca, Mn, Pb, and As contents pH and E (platinum) were determined on the solution portions. The values of $\text{pAl} + 3\text{pOH}$, $\text{pAl} + \text{pAsO}_4$, $\text{pFe} + 3\text{pOH}$, $\text{pFe} + \text{pAsO}_4$, $3\text{pCA} + 2\text{pAsO}_4$, $3\text{pMn} + 2\text{pAsO}_4$, and $3\text{pPb} + 2\text{pAsO}_4$ were computed for each soil. The values of the ion products indicated that equilibrium solutions from both soils were undersaturated with respect to Al, Fe, ad Ca and that Pb and Mn arsenate were stable in the Menfro and Sharpsburg soils.

W79-03099

DONNAN DIALYSIS MATRIX NORMALIZATION FOR CATHODIC STRIPPING VOLTAMMETRY, Southern Illinois Univ., Carbondale. Dept. of Chemistry and Biochemistry. J. A. Cox, and K. H. Cheng. Analytical Letters. Vol. A11, No 8, p 653-660, 1978. 1 tab, 7 ref. OWRT-A-087-ILL(4).

Descriptors: *Ion exchange membranes/phosphates, *Dialysis, Arsenate/stripping analysis, Volumetric analysis, *Analytical techniques, *Pollutant identification.

Previously reported cathodic stripping methods for the determination of phosphate and arsenate which were based upon reversible oxidation of Fe(II) to sparingly soluble salts at an inert electrode were subject to several interferences and were influenced by the sample matrix. In the present study Donnan dialysis was used to transfer the test ions from the sample into a controlled electrolyte. Subsequently, stripping analysis was performed. The resulting determinations were independent of the matrix of the original sample over a wide variety of conditions. Using lake water and wastewater samples, results were obtained which were statistically equivalent to widely accepted analytical procedures for trace level determinations.

W79-03103

A RECORD OF THE ACCUMULATION OF SEDIMENT AND TRACE METALS IN A CONNECTICUT, U.S.A., SALT MARSH, Yale Univ., New Haven, CT. For primary bibliographic entry see Field 5B. W79-03113

ENVIRONMENTAL PREFERENCES OF SELECTED FRESHWATER BENTHIC MACROINVERTEBRATES, Massachusetts Dept. of Environmental Quality Engineering, Westborough. Div. of Water Pollution Control. S. C. Travis. Publication No. 10795-103-50-8-78-CR 1978. 93 p, 5 fig, 9 tab, 50 ref, 1 append.

Descriptors: *Benthic fauna, *Bioindicators, *Water pollution effects, *Ecological distribution,

On-site data collections, Statistical methods, Niches, Massachusetts, Freshwater, Water quality, Monitoring, Aquatic habitats, Data collections, Discriminant analysis.

Using the concept of niche as an N-dimensional hypervolume, 12 variables were employed to illustrate the physical, chemical and microbiological parameters which provide separation between 25 genera of freshwater benthic macroinvertebrates. The study was based on data collected from 120 sites in the state of Massachusetts by the Massachusetts Division of Water Pollution Control during 1974 and 1975. The range of values under which each genus was collected is reported along with the genus mean for each variable. In a special analysis of organic pollution, a discriminant analysis was performed on dissolved oxygen, biochemical oxygen demand, ammonia and total coliform data. A single discriminant function was sufficient to account for 74.4% of the variation exhibited within the data. This function was used as an index of organic contamination for each station at which one of the 25 genera were collected. The preference exhibited by each genus for organic pollution was taken as its mean value (discriminant score). The analysis demonstrated several statistically significant differences between environmental preferences at the genus level. In particular, levels of organic contamination proved to be operationally significant in providing niche separation. Depth, velocity and substrate preferences also provided some niche separation and were correlated with eutrophic preference, the most pollution-sensitive general being associated with shallow depth, high velocities and complex substrates. However, the more pollution-tolerant types exhibited the broadest habitat distributions.

W79-03128

RESIDUALS MANAGEMENT PRIORITIES FOR THE MONONGAHELA RIVER BASIN, Resource Planning Associates, Inc., Washington, DC.

For primary bibliographic entry see Field 5G. W79-03146

AN IMPROVED HYDRAZINE REDUCTION METHOD FOR THE AUTOMATED DETERMINATION OF LOW NITRATE LEVELS IN FRESHWATER, Department of Scientific and Industrial Research Taupo (New Zealand). Freshwater Section.

M. T. Downes. Water Research, Vol. 12, No. 9, 1978, p 673-675. 4 fig, 6 ref.

Descriptors: *Pollutant identification, Freshwater, *Hydrazine reduction, *Methodology, *Nitrates, *Measurement, *Analytical techniques, Lakes, New Zealand, Nutrients, Nitrites, Hydrazine sulfate, Alkalinity, Copper, Zinc, Ions.

An automated method was developed for determining low nitrate levels (which rarely exceed 30 mg/cu m and often are less than 2 mg N/cu m) encountered in three lakes on New Zealand's North Island, in which nitrate is reduced to nitrite with hydrazine sulfate under alkaline conditions in the presence of copper (2+) and zinc (2+). Interferences present in natural water samples are eliminated by addition of zinc (2+) and the copper (2+) catalyst solution. The method compares favorably with the manual copperized cadmium technique for freshwater samples containing 10-800 mg/cu m nitrate-nitrogen. The method is also linear at nitrate concentrations below 10 mg N/cu m, whereas the automated copperized cadmium reduction technique does not have the required sensitivity or precision at low concentrations. With the new method the standard deviation of blanks and of samples containing two mg nitrate-nitrogen/cu m was 0.013 and 0.06 mg N/cu m, respectively, at an analysis rate of 30 samples/hr. The method modifies earlier techniques of Kamphake, et al., and of Mullin and Riley. Deionized distilled water was used throughout. The catalyst solution consisted of 0.0334 g A.R. CuSO₄-5H₂O plus 0.9 ZnSO₄-7H₂O in one liter water. Other reagents were 40 g/l sodium hydroxide solution, 1.71 g/l

hydrazine sulfate solution, 10 g sulfanilamide solution in one liter 10% A.R. hydrochloric acid, and one g/l N-1-naphthylethylenediamine dihydrochloride. (Lynch-Wisconsin) W79-03181

SOME FACTORS AFFECTING ON DRY WEIGHT, ORGANIC WEIGHT AND CONCENTRATIONS OF CARBON AND NITROGEN IN FRESHLY PREPARED AND IN PRESERVED ZOOPLANKTON, Scripps Institution of Oceanography, La Jolla, CA. M. Omori.

Internationale Revue der Gesamten Hydrobiologie, Vol. 63, No. 2, 1978, p 261-269. 2 fig, 4 tab, 14 ref.

Descriptors: *Zooplankton, Methodology, *Rinsing, *Drying, *Preservation, Weight, *Dry weight, *Organic weight, *Organic matter, *Carbon, *Nitrogen, *Calanus sinicus*, *Pleuroommata xiphias*, *Acartia tonsa*, *Sagitta nagaiae*, Copepods, Chaetognatha, Formaldehyde, Ammonium formate, Sea water, Freeze drying, Oven drying.

Effects of three rinses and four preservation techniques on dry weight, organic weight, total carbon, and total nitrogen of zooplankton specimens were evaluated. Rinses were: (1) distilled water, (2) seawater, and (3) ammonium formate. Preservation techniques were: (1) freeze-drying, (2) oven-drying, (3) borax-buffered formaldehyde-seawater solution, and (4) hexamine-buffered formaldehyde solution. Zooplankton tested were the chaetognath *Sagitta nagaiae*, and the copepods *Calanus sinicus*, *Pleuroommata xiphias*, and *Acartia tonsa*. Samples rinsed with distilled water were always lighter than samples rinsed with seawater, with apparent weight decreases in organic matter and total carbon and nitrogen; losses increased with increasing volume of rinse water. Use of such a hypotonic substance for even a short period may cause osmotic damage to cells and loss of intracellular material; distilled water volume should not exceed 0.3 ml/l mg dry wt of sample. Isotonic ammonium formate rinse often results in the widest range of variation; on the average organic weight and chemical contents were slightly lower than with filtered seawater. Freeze-drying resulted in dry and organic weights and chemical compositions somewhat higher than for oven-dried samples. A borax-buffered formaldehyde-seawater solution significantly decreased the weight of organic matter and chemical contents within 2.5 days, and after one week loss of organic weight exceeded 20%. Hexamine-buffered formaldehyde produced somewhat different results. (Lynch-Wisconsin) W79-03184

ORGANIC CARBON-A NONSPECIFIC WATER QUALITY INDICATOR FOR LAKE SUPERIOR, Minnesota Univ., Minneapolis. Dept. of Civil Mineral Engineering. W. J. Maier, and W. R. Swain. Water Research, Vol. 12, No. 8, p 523-529, 2 fig, 4 tab, 22 ref.

Descriptors: *Lake Superior, *Organic carbon, *Water quality indices, *Indicators, *Indicators, *Inorganic carbon, Biochemical oxygen demand, Organic matter, Carbon, Great Lakes, Lakes, Water quality, Combustion, Infrared radiation, Temporal distribution, Spatial distribution, Water pollution effects, Baseline studies, Oligotrophy, Methodology, Analytical techniques.

High total organic carbon (TOC) concentrations in Lake Superior correlated with low water quality (determined by criteria of the International Joint Commission for the Great Lakes), and a scale relating TOC to water quality for the lake was formulated. Measurement of organic carbon by combustion and infrared absorption is a promising technique for monitoring high quality water, such as found in Lake Superior; BOD is not sufficiently sensitive for characterizing relatively unpolluted waters, and measures only the biodegradable fraction of organics. TOC is a nonspecific test that determines the presence of reduced carbon, but

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Identification Of Pollutants—Group 5A

does not differentiate between biodegradable and biochemically refractory materials. Baseline concentrations of organic and inorganic carbon in Lake Superior were established on the basis of samples collected at 21 stations around the lake's perimeter and that of Isle Royale. Temporal and spatial distribution of organic carbon in open water and in the vicinity of pollution inflows is described. Unpolluted open water averages 1.1 mg/l TOC, and 8-10 mg/l total inorganic carbon (TIC). TIC levels at the surface and at a depth of five ft are indistinguishable. In the vicinity of point pollution sources TOC range 15-30 mg/l, the higher value indicating gross pollution. Shoreline or land mass effects were detected in all nearshore samples, where TOC and TIC values were somewhat higher than in open waters. In the Duluth-Superior harbor area TOC was an averaged 12.6 mg/l higher than open water, and TIC 17.1 mg/l higher. (Lynch-Wisconsin) W79-03186

CONTROL OF WASTE AND WATER POLLUTION FROM POWER PLANT FLUE GAS CLEANING SYSTEMS: FIRST ANNUAL R AND D REPORT,

Aerospace Corp., El Segundo, CA. Environment and Energy Conservation Div.

For primary bibliographic entry see Field 5G. W79-03251

EVALUATION OF SOURCES OF ODOR POLLUTION IN AN AREA OF KANSAS CITY, MISSOURI.

Midwest Research Inst., Kansas City, MO.

For primary bibliographic entry see Field 5G. W79-03256

CHEMICAL ANALYSIS OF INTERSTATE CARRIER WATER SUPPLY SYSTEMS,

Environmental Protection Agency, Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 600, Price codes: A06 in paper copy, A01 in microfiche. Report No. EPA-430/9-75-005, April 1975. 98 p, 2 tab.

Descriptors: *Water supply, *Water quality standards, *Chemical analysis, *Water data, Statistics, Data collections, Water analysis, Alkalinity, Sodium, Mercury, Iron, Manganese, Dissolved solids, Hardness, Public health, Drinking water.

Tabulated data reporting the chemical analysis of water supply systems serving interstate carriers is reported. Data has been furnished by the state agencies or are from analyses performed by Environmental Protection Agency laboratories. Chemical and related water quality criteria and the effects of the constituents in drinking water are summarized in Table I. The extent of non-compliance with the Drinking Water Standards (DWS) is summarized in Table II; only the number of supplies failing the mandatory limit is indicated when both mandatory and recommended limits are listed for a single constituent. The most common constituents which failed the DWS limits were: iron, manganese, and total dissolved solids. The current DWS does not contain limits for sodium, alkalinity, hardness, pH, or mercury. Mercury limits have been proposed, and concentrations of mercury failing to meet the proposed limit are indicated. Table II is arranged according to EPA regions and the states therein. (Davison-IPA) W79-03259

DEVELOPMENT OF AN ON-LINE ORGANIC ANALYZER FOR THE MUST WATER PROCESSING ELEMENT.

Absor, Inc., Wilmington, MA. Walden Div.

K. J. McNulty, R. L. Goldsmith, J. F. McCoy, and A. Zakak.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A025 116, Price Codes: A03 in paper copy, A01 in microfiche. Final Report, May 1976. 14 p, 6 fig, 2 ref.

DAMD 17-75-C-5051.

Descriptors: *Waste water treatment, *Instrumentation, *Organic wastes, Water pollution sources, Carbon, Oxidation, Water pollution treatment, Toxicity, Analyzers, Separation techniques, Organic compounds, Water quality, Waste treatment.

MUST waste treatment systems require an on-line organics monitor to control and monitor the level of organics in the treated effluent. As a first step in the development of such a system, a breadboard total organic carbon (TOC) monitor was designed, built, debugged and tested. The following sequential unit processes were involved in this system: inorganic carbon removal, catalytic oxidation of organic carbon to carbon dioxide, condensation and removal of water vapor, catalytic reduction of carbon dioxide to carbon tetrafluoride, and quantitative analysis for carbon tetrafluoride by flame ionization. Various standard solutions of potassium hydrogen phthalate were used to test the breadboard system; a Dohrmann DC-50 organic analyzer was used to determine the 'true' TOC's of the standard solutions. The breadboard system was in agreement with the commercial analyzer over the entire range of TOC's tested. Its estimated accuracy and linearity are + 1.75 mg/l. It is concluded that this concept using a continuous sample flow is comparable to commercially available TOC analyzers. (Davison-IPA) W79-03264

PERFORMANCE EVALUATION OF GUILDFINE MODEL 8400 LABORATORY SALINOMETER,

National Oceanographic Instrumentation Center, Washington, DC.

For primary bibliographic entry see Field 7B. W79-03270

NUTRIENT RUNOFF FROM FERTILIZED AND UNFERTILIZED FIELDS IN WESTERN CANADA,

Department of Agriculture, Swift Current (Saskatchewan). Research Station.

For primary bibliographic entry see Field 5B. W79-03290

A HYDROLOGIC STUDY OF WATER WELL YIELDS AND GROUNDWATER QUALITY RELATED TO STRATIGRAPHIC AND STRUCTURAL SETTINGS IN WESTERN JACKSON COUNTY, WEST VIRGINIA,

West Virginia Univ., Morgantown. Dept. of Geology and Geography.

D. S. Jones and H. W. Rauch.

January 1978. 24 p, 2 fig, 2 tab, 10 plate, 10 ref, 2 append.

Descriptors: *Groundwater resources, *On-site investigations, *West Virginia, *Ohio River, *Appalachian Mountain Region, Water wells, Water yield, Water quality, Alluvial aquifers, Bedrock, Nitrates, Fractures(Geologic), Aerial photography, Statistical methods, Lineaments.

Chemical and physical parameters for 86 wells and one spring were determined for a portion of western Jackson County, West Virginia. Many of the wells are fairly deep (median depth = 165 feet), with the median depth to water being 50 feet. Well yields are relatively low (median yield = 2.5 gpm). Valley wells, especially those with in 250 feet of a stream, have higher yields than hilltop or hillside wells. The primary rock aquifer units supplying water to 93% of the area's wells are lower Dunkard to middle-Monongahela in age. The best locations for tapping alluvial aquifers would be on a flood plain or terrace of the Ohio River, where yields of at least 10 gpm can be expected. Wells located within 100 feet of mapped photo-lineaments yield water at significantly greater rates than more distant wells. In general, groundwater quality is considered good. Groundwater in the Sandyville and Ripley quadrangles is usually quite soft. Groundwater in the Kenna quadrangle generally contains low total dissolved solids but often has excessive concentrations of iron. High sodium and chloride concentrations are common south of Cot-

tageville, and a few scattered wells showed evidence of nitrate pollution. (Visocky-ISWS) W79-03306

PREDICTED TRACE METAL CONCENTRATIONS IN SAIN SEEP WATERS,

Montana State Univ., Bozeman. Dept. of Chemistry.

For primary bibliographic entry see Field 5B. W79-03309

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE SANDSTONE AQUIFER, WISCONSIN,

Geological Survey, Madison, WI. Water Resources Div.

For primary bibliographic entry see Field 7C. W79-03341

CHEMICAL AND BACTERIOLOGICAL QUALITY OF WATER AT SELECTED SITES IN THE SAN ANTONIO AREA, TEXAS, FEBRUARY 1975 - SEPTEMBER 1977,

Geological Survey, San Antonio, TX. Water Resources Div.

R. D. Reeves.

Edwards Underground Water District, San Antonio, Tex., November 1978. 33 p, 1 fig, 1 tab, 14 ref.

Descriptors: *Water quality, *Groundwater, *Chemical analysis, *Bacteria, Dissolved solids, Heavy metals, Pesticides, Water supply, Domestic water, Water wells, Springs, *Texas, *San Antonio area(Tex), *Edwards aquifer(Tex).

Water samples collected from 79 wells and 3 springs in the Edwards aquifer in the San Antonio area, Texas, were analyzed for more than 50 properties or constituents, most of which affect the suitability of the water for domestic use. The samples were analyzed for bacteria; major inorganic constituents; minor elements, including heavy metals; and pesticides. (Woodard-USGS) W79-03353

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1977 WATER YEAR,

Geological Survey, Little Rock, AR. Water Resources Div.

For primary bibliographic entry see Field 7C. W79-03354

DESCRIPTION OF DATA-COLLECTION SYSTEM AND SYNOPSIS OF SELECTED HYDROLOGIC DATA FOR SOLDIER CREEK BASIN, KANSAS,

Geological Survey, Lawrence, KS. Water Resources Div.

For primary bibliographic entry see Field 7C. W79-03355

RAPID WEATHERING PROCESSES OF FUEL OIL IN NATURAL WATERS: ANALYSES AND INTERPRETATIONS,

Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewaesserschutz, Zurich (Switzerland).

For primary bibliographic entry see Field 5B. W79-03363

COMPARISON OF ASSOCIATIONS OF DIFFERENT HYDROCARBONS WITH CLAY PARTICLES IN SIMULATED SEAWATER,

Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.

For primary bibliographic entry see Field 5B. W79-03364

APPLICATION OF THE ROTATED DISK ELECTRODE TO MEASUREMENT OF COPPER COMPLEX DISSOCIATION RATE CONSTANTS IN MARINE COASTAL SAMPLES,

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5A—Identification Of Pollutants

North Carolina Univ. at Chapel Hill, Dept. of Environmental Sciences and Engineering.
M. S. Shuman, and L. C. Michael.

Environmental Science and Technology, Vol. 12, No. 9, p. 1069-1072, September 1978. 7 fig, 18 ref.

Descriptors: *Pollutant identification, *Copper, *Chelation, Metals, Measurement, Water pollution, *Outer Continental Shelf, U.S. Mid-Atlantic coast.

A rotating disk electrode technique was used to estimate dissociation rate constants of copper chelates formed in marine coastal samples, to measure the extent of Cu chelation in these samples, and to establish an operational definition for labile and nonlabile metal complexes based on a kinetic criterion. Samples collected off the mid-Atlantic coast showed various degrees of chelation toward copper. A first order dissociation rate constant for copper chelates was estimated to be of the order of 2 s to the (-1) power. (Sinha-OEIS)

W79-03365

ACCUMULATION OF SATURATED HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (*ANAS PLATYRHYNCHOS*),

New Orleans Univ., LA. Center for Bio-Organic Studies.

For primary bibliographic entry see Field 5C.
W79-03367

POSSIBLE ERRORS CAUSED PRIOR TO MEASUREMENT OF MERCURY IN NATURAL WATERS WITH SPECIAL REFERENCE TO SEAWATER,

Hokkaido Univ., Hakodate (Japan). Dept. of Chemistry.

K. Matsunaga, S. Konishi, and M. Nishimura.

Environmental Science & Technology, Vol. 13, No. 1, p. 63-65, January 1979. 2 fig, 4 tab, 17 ref.

Descriptors: *Mercury, *Measurement, *Water pollution, *Laboratory tests, Sea water, Pollutant identification, Metals, Outer Continental Shelf.

Taking seawater as an example, analytical problems in the mercury determination of natural waters are presented, with a special reference to errors caused prior to measurement of mercury. A mercury concentration of 0.5 ppb decreases rapidly even in an acidified solution, but the presence of sodium chloride prevents the adsorption loss onto the bottle wall. Therefore, if a seawater sample is acidified to 0.2 M with sulfuric acid at sampling, the mercury is stable for at least 60 days. Polyethylene bottles are unreliable because of mercury contamination. Glass bottles contaminated with mercury can be cleaned by heating at 500 deg C or rinsing with diluted hydrofluoric acid. Then there is no contamination and no mercury loss, the apparent mercury concentration an acidified seawater sample increases for a couple of weeks due to a change in form of the mercury species in seawater, and then reaches a constant value which is consistent with the value determined after digestion with a mixture of nitric acid and sulfuric acid, or a mixture of nitric acid and sulfuric acid, or a mixture of nitric acid, potassium permanganate, and persulfate. The level of 5-6 ng of Hg/L determined with the considerations described above seems to be the base-line concentration of mercury in the oceans. (Sinha-OEIS)

W79-03368

MEASUREMENT OF CU AND ZN IN SAN DIEGO BAY BY AUTOMATED ANODIC STRIPPING VOLTAMMETRY,

Naval Ocean Systems Center, San Diego, CA.

A. Zirino, S. H. Lieberman, and C. Claveli.

Environmental Science and Technology, Vol 12, No 1, p 73-79, January 1979. 12 fig, 13 ref.

Descriptors: *Metals, Copper, *Zinc, *Measurement, *Water pollution, Environmental effects,

Resources development, Tides, *California, Outer

Continental Shelf, *San Diego Bay(CA).

Cu and Zn values were measured in San Diego Bay by anodic stripping voltammetry with a specially built, automated instrument. During 1975-1977, trace metal surveys were conducted in the bay from a small vessel. Samples were collected and analyzed aboard the craft while underway. Cu and Zn concentrations were less than 0.1 and 0.6 micro g/L, respectively, at the mouth of the bay and increased toward the center of the bay to approximately 2.5 and 2.9 micro g/L, respectively. Also, synoptic measurements made at a stationary pier location showed that Cu and Zn concentrations coincided precisely but inversely with tidal cycles. Cu and Zn measurements made by automated anodic stripping voltammetry were compared to measurements made by extraction of Chelex 100 followed by analysis by flame atomic absorption spectrophotometry. The two methods produced values that were indistinguishable within experimental error. (Sinha-OEIS)

W79-03370

CHLORINATED AND SULFONATED DEGRADATION PRODUCTS OF LIGNIN IN THE EFFLUENTS FROM THE CHLORINE BLEACHING OF SULFITE PULP (CHLORIERTER UND SULFONIERTER LIGNINABBAUPRODUKTE IN ABWAESSERN DER CHLORBLEICHEN VON SULFITZELLSTOFF).

Technische Hochschule, Darmstadt (Germany, F.R.) Inst. fuer Makromolekulare Chemie.

T. Krause, and G. Widjaja.

Das Papier, Vol. 32, No. 7, p. 279-282, July, 1978. 5 fig, 2 illus, 10 ref, 1 tab. (English summary).

Descriptors: *Bleaching wastes, *Lignins, *Degradation(Decomposition), Wastes, Industrial wastes, Pulp and paper industry, Effluents, Water pollution sources, Chlorination, *Spectroscopy, *Ultraviolet radiation, *Infrared radiation, *Chromatography, Sulfonates, *Pollutant identification.

Lignin decomposition products were isolated from the wash waters of the chlorination stage of a spruce sulfite pulp bleach, using the method of Bottger, Krause, and Schurz, cf. Das Papier, Vol. 29, No. 7, p. 305-308, July, 1975. They were examined by UV and IR spectroscopy, and the degrees of chlorination and sulfonation were determined on several fractions obtained by gel chromatographic separation. (Ward-IPC)

W79-03405

POLLUTION CONTROL REGULATIONS AND MONITORING TECHNOLOGY: A REVIEW OF RESEARCH AND DEVELOPMENT FROM THE PULP AND PAPER INDUSTRY,

Victoria Univ. (British Columbia). Dept. of Biology.

D. V. Ellis.

Progress in Water Technology, Vol. 9, p. 673-682, 1977. 17 ref, 1 tab.

Descriptors: *Pulp and paper industry, *Water pollution, *Canada, *Monitoring, *Water quality standards, Foreign countries, Hydrogen ion concentration, Turbidity, Dissolved oxygen, Suspended solids, Toxicity, Water quality, Taste, Odor, Testing procedures, Effluent, Waste dilution, Dispersion, Pulp wastes, Water pollution sources, Instrumentation, British Columbia(Canada).

An environmental monitoring program to meet the requirements of water pollution control in force in British Columbia (Canada) is suggested for the pulp and paper industry. Step I is the monitoring of the numerically restrained receiving water parameter, viz., dissolved oxygen, pH, turbidity, settleable and suspended solids, and toxicity. Step II is the determination of the effluent's zone of influence using water quality parameter. Simple visual, smell, and taste characteristics should not be overlooked. Instrumental tests should include at least those on the numerically restrained parameter, but extended to a 3-dimensional sampling pattern to show dilution and dispersion of the effluent in addition to compliance with the regulations. Biological tests encompassing various levels in and routes through the local food chain are carried out in step III. (Swichtenberg-IPC)

W79-03410

NEW ONLINE SENSOR CHECKS SAVE ALL EFFLUENT FOR ITS FIBER CONTENT,

Consolidated Papers, Inc., Wisconsin Rapids, WI.

F. A. Gilbert, Jr., and P. J. Clack.

Pulp and Paper, Vol. 52, No. 9, p. 94-96, August, 1978. 4 fig, 1 tab.

Descriptors: *Pulp wastes, *Fibers(Plant), *Instrumentation, *Water analysis, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Turbidity, Filtration, Suspended solids, Savealls, White water(Paper machines), Calcium carbonate, Titanium dioxide, Starch, Clays, Industrial water.

Preliminary investigations by the Wisconsin Rapids Division of Consolidated Papers, Inc. showed that turbidity and filtration resistance measurements were not suitable indicators of the solids content of paper mill saveall effluents. The Leeds and Northrup Microtrac suspended solids monitor was more responsive to fiber changes than to filler changes (viz., calcium carbonate, clay, starch, and titanium dioxide) in the saveall effluent. This sensitivity is favorable, since a change in the fiber content of the clarified white water from the savealls is more likely to cause paper machine shower plugging. (Swichtenberg-IPC)

W79-03411

SYSTEM FOR ANALYSIS OF ORGANIC POLLUTANTS IN WATER,

La Trobe Univ., Bundoora (Australia). Dept. of Physical Chemistry.

J. D. Morrison, J. F. Smith, and S. F. Stepan. Technical Paper No. 28, Australian Water Resources Council, Department of National Resources, Australian Government Publishing Service, Canberra, 1977. 53 p, 29 fig, 13 ref, 3 append.

Descriptors: *Water pollution control, *Organic compounds, *Pollutant identification, *Polymer adsorption method, *Extraction, Computer systems, Gas chromatography, Volatility.

Experience gained in the analysis of organic pollutants in water has resulted in a selection of recommended methods for the detailed analysis of volatile organic compounds in water. A polymer adsorption method removed more than 90% of most organic compounds found as pollutants in water. The extraction method was successfully applied in the laboratory and in the field. A Kuderna-Danish evaporator was the most effective means of concentration after extraction. Packed columns were effective for gas chromatography of simple mixtures and SCOT columns provided better overall performance for complex mixtures. A small selection of liquid phases was sufficient for most samples. A computerized data system was found to be essential for practical use of GC-MS in analysis of water extracts. The system was shown to be effective in solving problems related to the analysis of drinking water and the pollution or ground water, as well as in the analyses of various effluents discharged by industry. (Bell-Graff-Cornell)

W79-03430

EMISSION OF MICROBIAL AEROSOLS FROM POLLUTED WATERS IN DENSELY POPULATED REGIONS,

Kentucky Water Resources Research Inst., Lexington.

L. S. Cronholm.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 947, Price codes: A04 in paper copy, A01 in microfiche. Research Report No. 117, 1978. 69 p, 8 fig, 12 tab, 36 ref. OWRT A-068-KY(1), 14-34-000107037, 14-34-0001-7038, 14-34-0001-8019.

Descriptors: *Enteric virus, Waste water treatment, *Air pollution effects, Water quality, *Pathogenic bacteria, *Aerosols, *Pollutant identification.

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

The air surrounding three activated sludge tanks was sampled over a two year period for the emission of bacterial aerosols under a variety of climatic conditions and at varying distances upwind and downwind of the aerated tanks. All plants emitted species of enteric bacteria which are significant as index organisms and as frank pathogens. The emission pattern of these bacteria were influenced by distance from the plant and wind direction. Within the parameters of a plant, defined arbitrarily in this study by sampling sites less than 150 m upwind and less than 900 m downwind, distance from the source was the only reliable predictor of emissions, and no statistical significance was found in the differences between upwind and downwind samples at the same distances from the plant. Multiple regression analysis revealed no consistent influences of any environmental factor or emission rate, but relative humidity, wind speed, air temperature, and ozone levels showed some contribution on the bacterial count, while light intensity appeared to have little influence. The deposition and retention of enteric bacteria on foliage plants near aerated basins was used as an alternate sampling method, and it emphasized the potential hazard of these aerosols. This method confirmed the inability to predict the emission rate by climatic factors, but wind speed contributed directly to the counts, and there was a pronounced difference in the average counts of upwind and downwind samples. (Hoffsey-Kentucky)
W79-03438

TEST ORGANISMS AND METHODS USEFUL FOR EARLY ASSESSMENT OF ACUTE TOXICITY OF CHEMICALS,

Dow Chemical, Midland, MI. Health and Environmental Research.

E. E. Kenaga.

Environmental Science and Technology, Vol. 12, No. 12, p. 1322-1329, 1978. 8 tab, 25 ref.

Descriptors: *Bioassay, *Chemical properties, *Pesticide toxicity, *Bioindicators, Insecticides, Herbicides, Toxicity, Pesticide residues, Daphnia, Rodents, Rainbow trout, Mallard duck, Shrimp, Analytical techniques, Testing procedures.

Acute toxicity data for 8 organisms commonly used for evaluation of environmental hazards of chemicals were collected and tabulated for 75 insecticides and herbicides. Correlations concerning the usefulness of each species as a selective, sensitive indicator to a wide spectrum of animal organisms were developed in order to provide a basis for selection of toxicity screening tests for use on thousands of industrial chemicals. The objective is to gain a maximum amount of information from a minimum amount of data based on science, and to know the degree of certainty associated with extrapolation of toxicity data from one species to another. On the basis of these correlations, three organisms were found to be the best indicators of acute toxicity to a wide variety of species. These organisms, the rat, one species of fish, and daphnia, are useful for the first round to acute toxicity testing when use and properties of the chemical result in significant environmental exposure. (EIS-Deal)
W79-03450

REGISTRATION OF THIRTY-THREE FISHERY CHEMICALS: STATUS OF RESEARCH AND ESTIMATED COSTS OF REQUIRED CONTRACT STUDIES,

Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.

For primary bibliographic entry see Field 5G.
W79-03452

A COMPARISON OF THE VARIABILITY OF ASELLUS COMMUNIS (CRUSTACEA: ISOPODA) AND GAMMARUS PSEUDOLIMNAEUS (CRUSTACEA: AMPHIPODA) AND SUITABILITY FOR JOINT BIOASSAYS, Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
D. M. Oseid.

Descriptors: *Bioassay, *Variability, Animal populations, *Crustaceans, Population, Laboratory tests, Testing procedures, Aquatic populations, Predation, Water chemistry, Water quality, Reproduction, Growth rates, Analytical techniques, *Asellus.

These tests indicate that as an individual test organism Asellus has several advantages. It has a lower variability, therefore fewer replications would be required to get the same precision. It can be easily cultured in high numbers in the laboratory and possibly the time to complete a generation is shorter, thereby reducing the time required to do full generation tests. However, apart from variability the tests also showed that in terms of the population parameters the two species produced fairly similar populations. Therefore, when tested in the same test chamber where the two species can interact, both species should have an equal chance to develop a population apart from factors such as competition, predator-prey relations, etc. (EIS-Deal)
W79-03459

ARSENIC CONCENTRATION IN CANNED TUNA FISH AND SARDINE,

Tehran Univ. (Iran). Dept. of Toxicology.

J. V. Karapetian, and A. M. Shahmoradi.

Bulletin of Environmental Contamination and Toxicology, Vol 20, p 602-605, 1978. 1 tab, 7 ref.

Descriptors: *Public health, *Heavy metals, Chemical analysis, Commercial fishing, Hazards, Spectrophotometry, Path of pollutants, Water pollution effects, Foods, Food processing, Industry, Water quality standards, *Arsenic compounds, *Arsenic, *Tuna, *Sardines, Tissue analysis, *Caspian Sea, *Persian Gulf.

Twenty samples of canned tuna fish from the Persian Gulf and ten samples of canned sardine from the Caspian Sea were collected. The range of arsenic concentrations in the tuna fish and sardine were 0.65 - 1.00 and 0.9 - 1.20 ppm and the means of the concentrations were 0.78 and 1.00 ppm, respectively. (EIS-Deal)
W79-03485

MERCURY DETERMINATION IN A RIVER OF MOUNT AMIATA,

Siena Univ. (Italy). Chair of Hydrobiology and Fish-Culture.

E. Bacci, C. Leonzio, and A. Renzoni.

Bulletin of Environmental Contamination and Toxicology, Vol 20, p 577-581, 1978. 1 fig, 11 ref.

Descriptors: *Mercury, *Mine wastes, *Mussels, Industrial wastes, Heavy metals, Animal metabolism, Path of pollutants, Mineral industry, Waste water treatment, Water pollution sources, Sediments, Molluscs, Tissue analysis, Depuration, Unio.

Since 1970 there has been a drastic reduction in the mining activity of this region because of the reduced world demand for mercury. The levels of mercury in water and mussels have been monitored during this reduction. The Hg level in the abductor muscle of mussels collected in 1973 was about one order of magnitude higher than the levels found in organisms collected in other rivers of Italy. In the years 1974-1976 the Hg concentration in the abductor muscles of specimens collected from the same station was sharply reduced. Reasons for this decrease and for the high background levels of Hg are discussed. (EIS-Deal)
W79-03487

MERCURY BURDENS IN CRAYFISH FROM THE WISCONSIN RIVER,

Wisconsin Dept. of Natural Resources, Madison.

Bureau of Water Quality.

T. B. Sheffy.

Environmental Pollution, Vol 17, p 219-225, 1978. 3 fig, 1 tab, 6 ref.

Descriptors: *Crayfish, *Mercury, *Bioindicators, Heavy metals, Wisconsin, Animal pathology.

Animal metabolism, Path of pollutants, Industrial wastes, Chemical wastes, Pulp wastes, Bottom sediments, Rivers, Monitoring, Wisconsin, Tissue analysis, Bioaccumulation, *Bioindicators, *Wisconsin River.

Mercury determinations were made on crayfish sampled at 34 locations along the Wisconsin River. Residue levels of mercury in crayfish abdominal muscle ranged from 0.07 to 0.56 ppm on a wet weight basis. The pattern of mercury accumulation in crayfish showed a striking similarity to that in bottom sediment, fish and mammals along the Wisconsin River. Based on this observation, the crayfish seems an accurate and convenient indicator species of mercury contamination along a river system, since it is easily obtained and provides an estimate of organic mercury accumulation for other species from the same area. (EIA-Deal)
W79-03488

THE TECHNICAL VARIABILITY IN BIOTIC INDICES,

University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.

P. M. Murphy.

Environmental Pollution, Vol 17, p 227-235, 1978. 5 fig, 1 tab, 18 ref.

Descriptors: *Bioindicators, *Seasonal, *Mathematical studies, *Statistical methods, Biological communities, Analytical techniques, Fluctuations, Sampling, Water quality, Baseline studies, Mathematical models, Methodology, Monitoring, *Biotic indices, Diversity, Chandler biotic score, Shannon-Weiner Index, Margalef Index, Menhinick Index.

The seasonal stability of six biotic indices used in the assessment of water quality was compared using data obtained from the River Wye and the River Cynon, a polluted tributary of the River Raff (South Wales). It was found that indices utilizing a qualitative approach, e.g. Chandler Biotic Score and Average Chandler Biotic Score, gave a far more consistent spatial discrimination between sampling stations than indices based on community diversity, e.g. Shannon-Weiner, Margalef and Menhinick. (EIS-Deal)
W79-03489

AN ASSESSMENT OF THE PERFORMANCE OF DIFFERENT BOTTOM SAMPLERS,

Akademicheskiy Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.

A. I. Bakarov.

Hydrobiological Journal, Vol 13 (2), 1977, p 88-94. 3 tab, 72 ref. (translated from Russian).

Descriptors: *Methodology, Monitoring, *Benthos, Sampling, On-site investigations, *Bottom sampling, Bottom sediments, Fish diets, Fish food organisms, Efficiencies, *Petersen dredges, *Ekman dredge, Bottom grab sampling, Working efficiencies, Statistical evaluation.

Comparison of the efficiency of the Petersen and Ekman grabs, used for evaluating the food supply of benthophagous fishes, with the modified Ekman bottom grab samplers revealed a statistically significant difference between them. Standard type instruments gave poorer results. The reasons for the unsatisfactory working of the bottom grabs are analyzed. (EIA-Katz)
W79-03495

5B. Sources Of Pollution

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN RUBBER PROCESSING OPERATIONS,

Research Triangle Inst., Research Triangle Park, NC. Center for Technology Applications.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-244 172, Price codes: A19 in paper copy, A01 in microfiche. Report No. EPA-560/1-75-002, July 1975. Proceedings, Conference on Environmental Aspects

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

of Chemical Use in Rubber Processing Operations, Akron University, Ohio, March 12-14, 1975. 459 p., 136 fig., 62 tab., 251 ref.

Descriptors: *Rubber, *Industrial wastes, *Conferences, *Environmental effects, *Chemical wastes, Byproducts, Pollution abatement, Odor, Liquid wastes, Effluents, Waste water treatment, Carbon black, Reclamation, Recycling.

Papers are presented and discussed in this, the first of three conferences on the environmental impact of chemicals in various industrial operations. Current chemical use in rubber processing operations, functions of chemicals in the operations, byproducts likely to be used, and measures used or available for use to control environmental contamination are covered. Specific topics include: odor sources, liquid effluents, secondary treatment of waste water, effects of chemicals, carbon black, environmental debris from tires, and reclaiming and recycling rubber. (Gibson-IPA)
W79-03008

STATE-OF-THE-ART SURVEY OF LAND RECLAMATION TECHNOLOGY, Little (Arthur D.), Inc., Cambridge, MA. For primary bibliographic entry see Field 5E.
W79-03025

DADE COUNTY INDUSTRIAL WASTE SOURCES, INVENTORY AND EVALUATION, National Field Investigations Center-Denver, CO. Available from the National Technical Information Service, Springfield, VA, 22161 as PB-258 404, Price codes: A03 in paper copy, A01 in microfiche. Report No EPA/33/2-71/003, March 1971. 42 p., 1 fig., 2 tab., 4 ref., 1 append.

Descriptors: *Water pollution sources, *Water quality, *Pollutant identification, *Industrial wastes, *Dade County, Aquifers, Water supply, Sewers, Canals, Miami River, Waste water disposal, Heavy metals, Hazards, Miami, Florida, Data collections.

Results of an industrial waste water inventory conducted from November 28, 1970 through February 1, 1971 in Dade County, Florida are presented. A total of 583 industries were interviewed by telephone and 233 field inspections were made. Fifteen of the 89 industries with significant waste water discharges release wastes into water courses. These include two soft-drink processors and a paper mill. A major portion of the remaining industries, located at Miami International Airport, discharge potentially hazardous wastes from aircraft painting, stripping, and cleaning into canals emptying into the Miami River. These canals eventually become part of the main water supply for Miami, and pollutants discharged into them represent a potential hazard to the Miami water supply. Waste waters of 38 industries are discharged to the domestic sewer system; some contain concentrations of heavy metals exceeding the criteria regulating the use of sanitary and storm sewers. Toxic compounds in waste water discharges of 36 industries become a source of pollution to the ground water aquifer underlying Dade County, because these wastes are discharged into 'dry wells'. (Davison-IPA)
W79-03030

FIELD INVESTIGATION OF TRACE METALS IN GROUNDWATER FROM FLY ASH DISPOSAL, Notre Dame Univ., IN.

T. L. Theis, J. D. Westrick, C. L. Hsu, and J. J. Marley.

Journal Water Pollution Control Federation, Vol. 50, No. 11, p 2457-2469, November 1978. 13 fig., 6 tab., 21 ref. ERDA EY-76-S-02-2727.

Descriptors: *Fly ash, *Trace elements, *Metals, *Groundwater, Water quality, Waste disposal, Water pollution, Water pollution sources, Pollutants, Seepage, Lagoons, Iron, Arsenic, Zinc, Copper, Nickel, Manganese, Lead, Sampling, Powerplants, Fly ash disposal.

Field studies were conducted at the fly ash disposal site of a 735 MW coal-fired power plant. Disposal consisted of ponding the ash, followed by eventual removal, and ultimate deposition as fill. Several sampling wells were made in order to monitor the groundwater quality. Results indicated that trace metals are released to the groundwater from the pond at generally low levels. Metals were found to accumulate in soils at the point of confluence of the pond seepage water with the natural groundwater. Precipitation of insoluble phases and adsorption of metals onto the higher levels of hydrous iron and manganese oxides were considered responsible for this. Nickel was singular in that data suggest that no precipitates were formed and adsorption did not occur under the conditions at the site. (Sims-ISWS)
W79-03055

FATE OF HERBICIDES CNP IN RIVERS AND AGRICULTURAL DRAINAGES, Kitakyushu Municipal Inst. of Environmental Health Sciences (Japan).

M. Suzuki, Y. Yamato, and T. Akiyama. Water Research, Vol 12, No 10, p 777-781, 1978. 4 fig., 3 tab., 16 ref.

Descriptors: *Herbicides, Water pollution, *Farm wastes, Pollutants, *Pollutant identification, Chemicals, Chemical analysis, Sampling, On-site investigations, Laboratory tests, Chemistry, Water chemistry, Path of pollutants, *Water pollution sources, Japan, *CNP residues.

The occurrence and fate of a herbicide CNP (2,4,6-trichlorophenyl-4'-nitro-phenylether) in rivers and agricultural drainages were investigated. CNP residues in water samples were extracted by adsorption on a macroreticular XAD-2 resin column and were subjected to gas chromatographic analysis using an electron capture detection after desorption from the column and concentration. The minimum detectable amount was 0.04 ng, and a positive identification of CNP residue in water samples was obtained with a combined gas chromatography-mass spectrometry-computer system when 500 ng of CNP was injected. CNP residues were detected in water samples taken in June to September, and these levels were between 0.01 and 16.67 microgram/liter. The maximum level was found in a sample taken on 13 July 1977, about a month after beginning rice seedling transplantation, and the minimum level was detected on 29 August 1977. However, CNP residue levels were increased again in September because flooded water on the paddy fields was excluded. CNP was more persistent in the aquatic environment than a herbicide benthiocarb. (Sims-ISWS)
W79-03065

A COMPARISON OF DISCRETE AND INTENSIVE SAMPLING FOR MEASURING THE LOADS OF NITROGEN AND PHOSPHORUS IN THE RIVER MAIN, COUNTY ANTRIM, Northern Ireland Dept. of Agriculture, Antrim. Freshwater Biological Investigation Unit. For primary bibliographic entry see Field 5A.
W79-03066

ACTINIDE ACTIVITIES IN WATER ENTERING THE NORTHERN NORTH SEA, Deutsches Hydrographisches Inst., Hamburg (Germany, F.R.). Lab. Sulidorf.

For primary bibliographic entry see Field 5A.
W79-03067

ARSENIC STABILITY IN CONTAMINATED SOILS,

Missouri Univ.-Columbia. Dept. of Agronomy. For primary bibliographic entry see Field 5A.
W79-03099

A RECORD OF THE ACCUMULATION OF SEDIMENT AND TRACE METALS IN A CONNECTICUT, U.S.A., SALT MARSH, Yale Univ., New Haven, CT.

R. J. McCaffrey.

PhD Dissertation, May, 1977. 148 p.

Descriptors: *Salt marshes, *Connecticut, *Trace elements, *Sedimentation rates, Wetlands, Marshes, Metals, Iron, Manganese, Copper, Land use, Air pollution.

Certain trace metals deposited in the salt marsh appear to behave in an analogous, conservative manner. Thus the historical rate of deposition of Mn, Fe, Cu, Zn, Pb, and total inorganic matter on the surface of the marsh may be calculated from the age and sediment properties measured at small depth increments. Changes in the inorganic matter content are attributed to variations in land use on the watershed since it was cleared for agriculture. Fe, Mn, and inorganic matter are principally derived from stream transport of eroding soil, while the observed increase in the fluxes of Cu, Zn, and Pb are largely explained as increased supply via the atmosphere during the period of the deposition of trace metals from polluted air masses over long periods of time. (Steiner-Mass)
W79-03113

PCB AND THE HOUSATONIC RIVER - A REVIEW AND RECOMMENDATIONS, Connecticut Academy of Science and Engineering, Hartford; and Connecticut Univ., Storrs. Inst. of Water Resources.

Connecticut Academy of Science and Engineering, Hartford, Connecticut. 1978. B. C. Bell (Editor); A. W. Sweeton, III, Chairman of the ad hoc Technical Committee on Housatonic River Pollution. 25 p., 30 ref. OWRT A-999-CONN(17), 14-34-0001-9007.

Descriptors: *Polychlorinated biphenyls, *Coolants, Water pollution effects, *Public health, Fish, *Oysters, Dredging, Reviews, *Connecticut, *Economic effects, *Possible carcinogenicity, *Industrial origin, *Landfill leaching, Atmospheric fallout, *Housatonic River(Conn).

The Housatonic River is contaminated by polychlorinated biphenyls (PCB), which is a class of toxic chemical compounds. These compounds have accumulated in the bottom sediments of the river during a period of over 40 years, largely as a result of their leakage into the river at the General Electric Company plant in Pittsfield, Massachusetts. Their extreme chemical inertness, which made them suitable for industrial application as cooling liquids in electrical capacitors and other electrical equipment, means that the concentration of PCB in the sediments has increased with time. The situation became critical several years ago, when it was discovered that fish in the river contained concentrations of PCB in excess of 5 parts per million, a limit set by the USFDA. Consequently, the State Department of Health in 1977 issued a health advisory against eating fish from the Housatonic. The current report, which is intended as a guide to policymakers, summarizes information about the chemical nature of PCB, the limited information about their toxicity, and the present situation on the Housatonic River. Its major recommendation is that this public health hazard is sufficiently serious that a sustained effort should be made to establish its parameters by monitoring the concentration of PCB in the Housatonic River, in other bodies of water in Connecticut, and in the drainage path of landfills. Other recommendations deal with the need to gain more precise information about PCB and with the exchange of information among the many different government agencies and private organizations that are concerned with different facets of the problem.
W79-03114

DYNAMICS OF POLYCHLORINATED BI-PHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT, PHASE 1, TASK 1, COMPILATION OF INFORMATION, URS Co., Seattle, WA.

For primary bibliographic entry see Field 5C.
W79-03118

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

DYNAMICS OF POLYCHLORINATED BI-PHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT PHASE 1, TASK 2: EVALUATION OF COMPILED INFORMATION.
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03119

ACCOMPLISHMENT PLAN, REGION VIII, UTAH LAKE-JORDAN RIVER BASIN.
Environmental Protection Agency, Denver, CO, Region VIII.
For primary bibliographic entry see Field 5G.
W79-03149

DISTRIBUTION AND ABUNDANCE OF PHYTOPLANKTON IN 153 LAKES, RIVERS, AND POOLS IN THE NORTHWEST TERRITORIES.
Canada Environmental Protection Service, Yellowknife (Northwest Territories).
For primary bibliographic entry see Field 5C.
W79-03185

A METHOD FOR THE ANALYSIS OF ENVIRONMENTAL FACTORS CONTROLLING PATTERNS OF SPECIES COMPOSITION IN AQUATIC COMMUNITIES.
Manitoba Univ., Winnipeg, Dept. of Zoology.
For primary bibliographic entry see Field 5C.
W79-03187

THE PESTICIDE CONTENT OF SURFACE WATER DRAINING FROM AGRICULTURAL FIELDS—A REVIEW.
Science and Education Administration, Stoneville, MS, Southern Weed Science Lab.
R. D. Wauchope.
Journal of Environmental Quality, Vol. 7, No. 4, p 459-472, October-December 1978. 3 fig, 4 tab, 69 ref.

Descriptors: *Pesticides, *Runoff, *Agricultural runoff, *Water pollution sources, *Reviews, Water pollution, Herbicides, Insecticides, Pesticide residues, Water quality, Rainfall, Storms, Sediments, Farm management, Agriculture, Bibliographies, *Nonpoint water pollution sources.

The literature on pesticide losses in runoff waters from agricultural fields was reviewed. For the majority of commercial pesticides, total losses are 0.5% or less of the amounts applied, unless severe rainfall conditions occur within 1-2 weeks after application. Exceptions are the organochlorine insecticides, which may lose about 1% regardless of weather pattern because of their long persistence; and soil surface-applied, wettable-powder formulations of herbicides, which may lose up to 5%, depending on weather and slope, because of the ease of washoff of the powder. Pesticides with solubilities of 10 ppm or higher are lost mainly in the water phase of runoff, and erosion control practices will have little effect on such losses. Organochlorine pesticides, paraquat, and arsenical pesticides, however, are important cases of pesticides which are strongly adsorbed by sediments, and erosion control can be important in controlling losses of these compounds. The behavior and fate of pesticides in streams receiving runoff is generally not known. Information on such factors as time and distance of impact of a given runoff event, ability of local ecosystems to recover from transient pesticide concentrations, and dissipation or concentration processes in aquatic ecosystems will have to be obtained before 'edge-of-field' pesticide losses can be related to water quality in receiving waters. (Sims-ISWS)
W79-03289

NUTRIENT RUNOFF FROM FERTILIZED AND UNFERTILIZED FIELDS IN WESTERN CANADA.
Department of Agriculture, Swift Current (Saskatchewan), Research Station.
W. Nicholaichuk, and D. W. L. Read.
Journal of Environmental Quality, Vol. 7, No. 4, p

542-544, October-December 1978. 2 tab, 13 ref.
Descriptors: *Nutrients, *Runoff, *Agricultural runoff, *Fertilizers, *Canada, Nitrogen, Phosphorus, Sediments, Erosion, Snowmelt, Crops, Wheat, Water quality, Water pollution, Water pollution sources, Chemicals, Chemical analysis, Sampling, *Saskatchewan(Canada).

Nutrient transport in surface runoff from snow was measured from fertilized and unfertilized cropped and summerfallow Wood Mountain loam fields in semiarid southwest Saskatchewan. The amount of nitrogen lost from unfertilized fields during spring runoff exceeded the limits purported to result in algal growth; however, the loss was agronomically insignificant. It was concluded that since the N and P concentrations in runoff from unfertilized fertile agricultural soils exceed Saskatchewan Water Quality criteria, these guidelines may be regarded as unattainable under the present system of cereal cropping in western Canada. (Sims-ISWS)
W79-03290

BROMACIL IN LAKELAND SOIL GROUND WATER,
Southeastern Forest Experiment Station, Marion, FL.

E. A. Hebb, and W. B. Wheeler.
Journal of Environmental Quality, Vol. 7, No. 4, p 598-601, October-December 1978. 1 fig, 1 tab, 21 ref.

Descriptors: *Herbicides, *Groundwater, *Pesticides, *Leaching, Sampling, Chemical analysis, Rainfall, Pesticide residues, Pollutants, *Path of pollutants, Water pollution, Water pollution sources, *Bromacil.

The objective of this study was to evaluate the probable magnitude of the problem of the leaching of pesticides into groundwater under extreme conditions: a sandy soil low in organic matter, a persistent and mobile herbicide applied at a high rate, plentiful rainfall, and a water table within 6 m. Bromacil (5-bromo-3-sec-butyl-6-methyl-uracil) was applied at the rate of 22 kg/ha to a Lakeland sand bearing scrub vegetation of small oaks and poor grasses. Groundwater (at depths ranging from 4.5 to 6 m) was sampled from bromacil residue at weekly intervals for 2 years. Residue was first found in the groundwater 3 months after application and was highest (1.25 ppm) 1 month later. Thereafter the amount declined to less than 0.1 ppm in about a year and less than 0.001 ppm in 2 years. Peaks in residues generally followed periods of increased rainfall by about 2 weeks. Residues (0.24 ppm) were still detected in the surface soil 2 years after application. (Sims-ISWS)
W79-03291

IN WHAT WAY IS WATER POLLUTION INFLUENCED BY SEWERAGE SYSTEMS?
DHV Consulting Engineers, Amersfoort (Netherlands).c
J. B. M. Wiggers, and K. Bakker.

Hydrological Sciences Bulletin, Vol. 23, No. 2, p 257-266, June 1978. 5 fig, 1 tab, 3 ref.

Descriptors: *Sewers, *Drainage systems, *Water pollution, *Model studies, Mathematical models, Combined sewers, Separated sewers, Storm drains, Storm runoff, Urban drainage, Urban hydrology, Storage, Design storm, Flooding, Overflow, Precipitation(Atmospheric), Design, Hydraulic design, Pollution abatement.

A sewerage system was defined, and the sources of pollution were described. The relationship between the amount of pollution and the hydraulic design criteria was outlined. It was shown that in flat or slightly undulating areas, the efficiency of sewer networks can be improved and their costs can be reduced without the need for detailed hydrological investigations. A simulation model of the pollution discharge was presented, and some of the results were discussed. One of the findings is that a combined sewer system can be as effective as a separate system in relation to surface water

pollution. This needs to be verified in practice. In order to be able to choose the optimal solutions for pollution abatement, it is important to define the quality of surface water required in a much more accurate way than is done at present. (Sims-ISWS)
W79-03298

MICROBIAL SULFUR CYCLE ACTIVITY AT A WESTERN COAL STRIP MINE,
Montana State Univ., Bozeman, Dept. of Microbiology.

G. J. Olson, and G. A. McFeters.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 722, Price codes: A05 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Montana State University, Research Report Number 98, November 1978. 79 p, 5 fig, 14 tab, 71 ref. OWRT A-108-MONT(1), 14-34-0001-8028.

Descriptors: *Water pollution, *Acid mine water, *Sulfur bacteria, *Coal mine wastes, *Strip mine wastes, Decker mine, Wyoming, Sulfate reducing organisms, Acidophilic iron organisms, Thiobacillus ferrooxidans.

Certain groups of sulfur cycle bacteria found in waters, sediments, and the coal seams of a strip mine at Decker and other mines of southeastern Montana and northeastern Wyoming were studied. Thiobacillus ferrooxidans, one of the major contributors to acid mine drainage, was consistently detected in the mining environment. Physiological studies of *T. ferrooxidans* isolates indicated that these acidophilic iron and sulfur oxidizing organisms were typical of the species in their preference for low pH and ability to oxidize pyrite. Since (1) acidic conditions were never observed at Decker, (2) the isolates died off in mine water environments, and (3) no acid could be formed from coal samples inoculated with a *T. ferrooxidans* isolate, it was thought that their activity was limited to microzones in the coal bearing strata when they oxidized sulfide material. Any acid formed was quickly neutralized by bicarbonate heavy metals. Hydrogen sulfide and sulfate reducing bacteria were detected in the water from all but one of the wells samples in over a wide area in southeastern Montana. Although the activity of these organisms in the groundwater could not be demonstrated, a comparison of stable sulfur isotope ratios between groundwater sulfates and sulfides indicated the sulfate was likely produced by sulfate reducing bacteria. (Hunt-Montana)
W79-03308

PREDICTED TRACE METAL CONCENTRATIONS IN SAINE SEEP WATERS,
Montana State Univ., Bozeman, Dept. of Chemistry.

G. K. Pagenkopf.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 723, Price codes: A02 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center Montana State University Research Report Number 99, November 1978. 20 p, 2 fig, 14 tab, 12 ref. OWRT A-110-MONT(1), 14-34-0001-8028.

Descriptors: *Water pollution sources, *Saline water, *Groundwater, *Seepage, *Pollutant identification, *Trace elements, *Computer models, *Mathematical models, Water chemistry, Soil chemical properties, *Metals, *Montana saline seep areas, Thermodynamic equilibrium model, Ionic activity coefficient, Aluminum, Cadmium, Cobalt, Copper, Nickel, Lead and zinc.

Saline seep waters often contain concentrations of trace metals that are higher than those commonly encountered in non-polluted surface waters. These waters also contain extremely high concentrations of sodium, magnesium and sulfate. An equilibrium model has been developed that predicts the concentrations of aluminum, cadmium, cobalt, copper, nickel, lead, and zinc in the saline seep waters. Ionic activity coefficients are calculated from major component analyses data. Best agreement

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between calculated and observed concentrations of trace metals is obtained for aluminum, copper, and lead. Agreement for cadmium and nickel is good provided the pH values are above eight. The solutions appear to be super saturated with respect to cobalt carbonate. Agreement for zinc is good for some samples but poor for others. (Hunt-Montana) W79-03309

GROUND-WATER RESOURCES OF THE CAPE LOOKOUT NATIONAL SEASHORE, NORTH CAROLINA.
Geological Survey, Raleigh, NC. Water Resources Div.
For primary bibliographic entry see Field 2L.
W79-03337

PREDICTED WATER-LEVEL AND WATER-QUALITY EFFECTS OF ARTIFICIAL RECHARGE IN THE UPPER COACHELLA VALLEY, CALIFORNIA, USING A FINITE-ELEMENT DIGITAL MODEL.
Geological Survey, Menlo Park CA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03346

URBAN STORM-WATER-QUALITY DATA, PORTLAND, OREGON, AND VICINITY,
Geological Survey, Portland, OR. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03349

HYDROLOGIC RECONNAISSANCE OF THE FISH SPRINGS FLAT AREA, TOOKEE, JUAB, AND MILLARD COUNTIES, UTAH,
Geological Survey, Salt Lake City, UT. Water Resources Div.
For primary bibliographic entry see Field 4A.
W79-03350

RAPID WEATHERING PROCESSES OF FUEL OIL IN NATURAL WATERS: ANALYSES AND INTERPRETATIONS.
Eidgenoessische Anstalt fuer Wasserversorgung, Abwasserreinigung und Gewässerschutz, Zurich (Switzerland).
F. Zurcher, and M. Thuer.

Environmental Science and Technology, Vol 12, No 7, p 838-843, July 1978. 3 fig, 1 tab, 21 ref.

Descriptors: *Weathering, *Oil pollution, *Laboratory tests, *Clay minerals, Fuels, Environmental effects, Resources development, Baseline studies, Suspended solids, Outer Continental Shelf, No. 2 fuel oil.

The fate-determining steps of weathering petroleum in the aquatic environment were studied in model experiments. Capillary column gas chromatography and infrared adsorption measurements showed different weathering processes for No. 2 fuel oil, depending on the turbulence and the level of suspended solids (kaolinite) in water during experiments. Partial dissolution, adsorption, dispersion, and agglomeration of No. 2 fuel oil initially occurred and resulted in the fractionation of the original oil mixture. Alkylated benzenes and naphthalenes were enriched in the water phase (up to 5 mg/l), certain aliphatic hydrocarbons above mol wt 250 were adsorbed onto kaolinite (200 mg/kg), and oil droplets were agglomerated with suspended minerals (20 g/kg) after increased turbulence. The same fractionation pattern was observed for a ground water oil spill, although the oil was already biochemically altered. (Sinha-OEIS) W79-03363

COMPARISON OF ASSOCIATIONS OF DIFFERENT HYDROCARBONS WITH CLAY PARTICLES IN SIMULATED SEAWATER.
Michigan Univ., Ann Arbor. Dept. of Atmospheric and Oceanic Science.
P. A. Meyers, and T. G. Oas.
Environmental Science and Technology, Vol 12,

No 8, p 934-937, August 1978. 3 fig, 1 tab, 13 ref.

Descriptors: *Clay minerals, *Oil pollution, *Sediments, *Water pollution, Pollutant identification, Laboratory tests, Hydrocarbons, Petroleum.

Some aspects of the association of hydrocarbons and smectite clay in simulated seawater were investigated using NaCl solutions in laboratory experiments. Both n-eicosane and n-eicosene displayed identical association behaviors with this clay. Association increased linearly with increasing hydrocarbon concentration in water. The amount of n-alkane associated with smectite increased with carbon chain length from C17 to C28, reaching a maximum of 70% removal from water. This may be due to decreased accommodation in water as hydrocarbon chain length becomes larger. The level of association of aromatic hydrocarbons was generally low, and isoalkanes were more effectively removed from water than n-alkanes of the same number of carbons. (Sinha-OEIS)
W79-03364

APPLICATION OF THE ROTATED DISK ELECTRODE TO MEASUREMENT OF COPPER COMPLEX DISSOCIATION RATE CONSTANTS IN MARINE COASTAL SAMPLES,

North Carolina Univ. at Chapel Hill. Dept. of Environmental Sciences and Engineering.
For primary bibliographic entry see Field 5A.
W79-03365

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
For primary bibliographic entry see Field 5C.
W79-03366

DISTRIBUTION OF POLYCHLORINATED BI-PHENYLS (PCB) IN ESTUARINE ECOSYSTEMS. TESTING THE CONCEPT OF EQUILIBRIUM PARTITIONING IN THE MARINE ENVIRONMENT,

URS Co., Seattle, WA.
S. P. Pavlou, and R. N. Dexter.
Environmental Science and Technology, Vol 13, No 1, p 65-71, January 1979. 4 fig, 7 tab, 31 ref.

Descriptors: *Estuarine environment, *Polychlorinated biphenyls, *Ecosystems, Pollutant identification, Water pollution, Environmental effects, *Washington, Path of pollutants, Distribution, Outer Continental Shelf, *Puget Sound(WA).

Spatial and temporal trends in the chlorobiphenyl concentrations observed in various marine components of Puget Sound between 1973 and 1977 are presented. The distribution and accumulation characteristics are discussed in terms of the physical chemical processes that control their flow throughout the ecosystem. For the low levels detected in seawater, the data suggest that uptake is predominantly governed by equilibrium partitioning of the chemicals between suspended phases and ambient water. (Sinha-OEIS)
W79-03369

MEASUREMENT OF CU AND ZN IN SAN DIEGO BAY BY AUTOMATED ANODIC STRIPPING VOLTAMMETRY,
Naval Ocean Systems Center, San Diego, CA.
For primary bibliographic entry see Field 5A.
W79-03370

LIGHT HYDROCARBONS IN RECENT TEXAS CONTINENTAL SHELF AND SLOPE SEDIMENTS,

Texas A and M Univ., College Station. Dept. of Oceanography.
B. B. Bernard, J. M. Brooks, and W. M. Sackett.
Journal of Geophysical Research, Vol 83, No C8, p 4053-4061, August 20, 1978. 7 fig, 3 tab, 24 ref.

Descriptors: *Oil pollution, *Sediments, *Water pollution sources, *Texas, Microbial degradation,

*Gulf of Mexico, Outer continental shelf, *Hydrocarbons.

The distributions of the concentrations of methane, ethene, ethane, propane, and propene in twelve 1- to 2-m long gravity cores for two transects from nearshore to midslope off the southwest Texas Gulf Coast are reported. Methane profiles exhibit maxima in the top 40 cm of sediment on the shelf, in contrast to downward increasing gradients in the slope region. Nearshore surface methane concentrations ranging from 50 to 400 micro l (normal temperature and pressure) per liter pore water are apparently due to microbial production in sulfate-free microenvironments such as fecal pellets in a near-seawater sulfate environment. A decrease in sediment methane levels to less than 5 micro l/pore water in down-slope sediments is attributed to reduced microbial activity due to lower organic contents and temperatures. Profiles of the saturated and unsaturated C2 and C3 hydrocarbons suggest that these gases are also microbially produced. (Sinha-OEIS)
W79-03371

AN EVALUATION OF OIL AND GREASE CONTAMINATION ASSOCIATED WITH DREDGED MATERIAL CONTAINMENT AREAS,

Engineering-Science, Inc./Texas, Austin.
C. T. White.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A048 595, Price codes: A08 in paper copy, A01 in microfiche. Army Engineer Waterways Experiment Station Technical Report No. D-77-25, November 1977, 154 p, 41 fig, 28 tab, 43 ref, append. DACW39-75-C-0125.

Descriptors: *Oil pollution, *Water pollution sources, *Environmental effects, *Dredging, Sediments, Waste disposal, Resources development, Outer Continental Shelf, Dredged material, Grease.

Field studies were conducted at six locations where dredging is practiced, and both water and sediment samples were collected at these sites. The samples were analyzed for various environmental factors with the intent of establishing whether or not release of oil and grease from dredged sediments could be predicted on the basis of the environmental factors. The results of the field study strongly indicated that oil and grease are not released from sediments to a significant extent during the dredging process. It was found that relatively high oil levels in return waters were associated with high suspended solids concentrations, but that the various factors could not be related to the release of oil and grease from sediments. A bench-scale study was devised to delineate the significant factors affecting the release of oil and grease from dredged sediments; however, no consistent relationships were found. The bench-scale results confirmed the field study results in that oil and grease concentrations in the water phase were quite low, even with particularly oily sediments. (Sinha-OEIS)
W79-03377

FIELD INVESTIGATIONS OF CONVERGENCES AND SLICK CONCENTRATION MECHANISMS IN DELAWARE BAY. RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies.
C. C. Sarabun, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 692, Price codes: A05 in paper copy, A01 in microfiche. National Science Foundation, Research Applied to National Needs (RANN) Report No. NSF/RAN-770307, 1977. 86 p, 17 fig, 3 tab, 6 ref, 3 append. NSF-G141896.

Descriptors: *Oil pollution, River flow, *Water pollution sources, Baseline studies, Delaware River, Resources development, Environmental ef-

fects, Crude

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Sources Of Pollution—Group 5B

fects, Outer Continental Shelf, *Delaware Bay, Crude oil, *Oil slicks, Refineries.

Field studies conducted in the channel north of the Delaware Bay lightering anchorage are discussed. Significant differences are found to exist between the winter-spring season when only a single front occurs, and the summer-fall when multiple, internal waves appear on a persistent near-surface pycnocline. Although the data is not conclusive, some effects of variation in river-flow can be seen. (Sinha-OEIS)
W79-03378

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,

Coastal Engineering Research Center, Fort Belvoir, VA.

R. K. Schwartz, and F. R. Musialowski.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A051 575, Price codes: A02 in paper copy, A01 in microfiche. Reprint No. 78-6, February 1978. Reprinted from: Coastal Sediments '77, p 85-101, 18 p, 8 fig, 7 ref.

Descriptors: *Sediment transport, *Dredging, *Environmental effects, *Erosion, Sedimentation, Spoil banks, *North Carolina, Outer Continental Shelf, Nearshore processes, Dredge disposal.

During the summer of 1976, 26,750 of relatively coarse sediment was dredged from New River Inlet, N.C., moved downcoast using a split hull barge, and placed in a 215 m coastal reach between the 2 m and 4 m depth contours. Bathymetric changes on the disposal piles and in the adjacent beach-nearshore area were studied for a thirteen week period to determine the modification of the surrounding beach-nearshore profile and the net transport direction of the disposal sediment. Surveys showed accretion at the base of the foreshore, complete filling of the trough, a platform or new trough at the initial surf-zone bar position, disappearance of the surf-zone bar, and generally a more seaward surf zone boundary. Profiles adjacent to the disposal area showed slight accretion seaward of the surf zone. The predominant transport direction of disposal sediment is interpreted to have been shoreward into the surf zone (in the direction of the coarsest native sand) and then in the direction of the longshore current. The increased width of the platform-disposal bar complex may provide benefits by increasing the amount of wave energy dissipation in the surf zone and hence, less erosion of the beach. (Sinha-OEIS)
W79-03382

CONIFER NEEDLE PROCESSING IN A SUB-ALPINE LAKE,

Washington Univ., Seattle. Coll. of Forest Resources.

G. H. Rau.

Limnology and Oceanography, Vol. 23, No. 2, p 356-358, March, 1978. 1 fig, 17 ref.

Descriptors: *Coniferous trees, *Needles, *Biodegradation, Underwater, Lakes, Lake sediments, Fir trees, Hemlock trees, Washington, Weight, Water pollution, Water pollution sources, Degradation(Decomposition), Findley Lake(Washington), Abies amabilis, Tsuga mertensiana, Waste disposal, Littoral.

The weight loss of fir (Abies amabilis) and hemlock (Tsuga mertensiana) needles introduced into a littoral benthic site in Findley Lake, Washington, was studied. The needles were contained in nylon mesh (0.8 x 0.8 mm or 0.073 x 0.073 mm square mesh) bags or skewered onto stainless steel pins housed in slotted plastic containers. Both fir and hemlock needles lost an average of 80-90% of their initial dry weight after 1-year of incubation. Considerably less mean weight was lost from needles in fine and coarse mesh bags. In all treatments there was little change in mean needle weight during the second year of the experiment. (Witt-IPC)
W79-03400

HARVESTING EFFECTS ON SOIL AND WATER IN THE EASTERN HARDWOOD FOREST,

Northeastern Forest Experiment Station, Parsons, WV. Timber and Watershed Lab.

For primary bibliographic entry see Field 4C.
W79-03412

TMP (THERMOMECHANICAL PULPING) EF-FLUENTS - A REVIEW,

Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).

For primary bibliographic entry see Field 5C.
W79-03414

IMPROVE IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET,

Colorado State Univ., Fort Collins. Dept. of Economics.

For primary bibliographic entry see Field 5G.
W79-03420

A STUDY OF NITRIFICATION IN THE DELAWARE RIVER ESTUARY,

Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.

R. B. Tiedemann.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-290 488, Price codes: A12 in paper copy, A01 in microfiche. MS Thesis, June 1977. 259 p, 45 fig, 53 tab, 49 ref, append. OWRT B-054-NJ(1), 14-31-001-5091.

Descriptors: *Estuaries, *Nitrification, *Ammonia, *Water quality, Denitrification, Nutrients, *Delaware River estuary, Benthic deposits, Growth dynamics.

The process of nitrification is evident in a variety of environments and has been studied in the terrestrial and upland river ecosystems. However, a minimum of work has been performed upon nitrification as it applies to the estuarine system. Nitrification in the Delaware River Estuary has been identified to seasonally occur within an upstream and a downstream region with a site of inhibition situated between the two. Nitrosomonas and Nitrobacter populations within the water were held accountable for the bulk of nitrification exhibited in the estuary. Assessments of benthic and wetlands nitrification were not conducted but are considered contributing mechanisms to the total expression of nitrification within the estuarine system. A combination of proper residence time and concentrations of NH₃, NO₂, dissolved oxygen, and carbon allow significant nitrification to occur within the water with lengthy residence time being particularly unique to the estuary. Only a small nitrifying seed is required for nitrifying populations to build to considerable levels in the Delaware Estuary. The source of that seed has been reviewed in six hypotheses which may operate individually or in combination. A suggestion for future investigations is the identification of which hypothesized processes are active within the Delaware Estuary and to what degree. (Hunter-Rutgers)
W79-03439

WATER + WEEDS + HEAT = NOVEL EXPERIMENTATION,

Beak Consultant Ltd., Calgary (Alberta).

For primary bibliographic entry see Field 5G.
W79-03456

USE OF SODIUM THIOSULFATE DECHLORINATED MUNICIPAL WATER IN SALMON CULTURE,

Weyerhaeuser Co., Springfield, OR.

B. J. Allee, and R. W. Anderson.

In: 26th Annual Northwest Fish Culture Conference, Dec 3-5, 1975, Otter Rock, Oregon, p 18-23, 1 tab, 7 ref.

Descriptors: *Bioassay, *Mortality, *Aquaculture, *Chlorination, De-chlorination, *Sodium thiosulfate.

fate, Fish hatchery, Fish physiology, Chemical analysis, Sodium thiosulfate, Saltwater survival, Enzymes, Gill ATP-ase levels, Blood chemistry, Waste treatment.

A bioassay was conducted assessing growth, freshwater survival, blood chemistry, gill-ATP-ase levels and saltwater survival for coho salmon reared in sodium thiosulfate dechlorinated water and an unchlorinated control. No detrimental effects were observed in fish survival, growth, health, saltwater survival or gill ATP-ase levels when compared to a common source control. (EIS-Katz)
W79-03422

INTERFACING HYDROTHERMAL AND BIOLOGICAL STUDIES IN WASTE HEAT MANAGEMENT,

MacLaren (James F.) Ltd., Willowdale (Ontario).

P. E. Wisner, D. B. Hodgins, and F. E. J. Fry. Canadian Water Resources Journal, Vol 3, No 3, p 13-32, 1978. 6 fig, 3 tab, 11 ref.

Descriptors: *Thermal pollution, *Cooling water, Heated water, Water temperature, Thermal powerplants, Outlets, Effluents, Water quality standards, Thermal stress, Water pollution sources, Heat resistance, Entrainment, Toxicity, Bioassay, Aquatic populations, Nuclear powerplants, Mathematical models, Engineering, *Thermal effluent.

The selection of a waste heat management alternative for a steam-electric generating station and the level of sophistication of hydrothermal modelling used in the analysis of the alternative can only be efficient if related to three factors. These are: the stage of the study, the available environmental data, and the level of environmental/biological significance of the water body. The main thrust of this paper is to illustrate a simple methodology for effectively combining these various factors. (EIS-Deal)
W79-03463

SIMULATION ANALYSIS OF THE CONCENTRATION PROCESS OF TRACE HEAVY METALS BY AQUATIC ORGANISMS FROM THE VIEWPOINT OF NUTRITION ECOLOGY, Kyoto Univ. (Japan). Dept. of Sanitary Engineering.

I. Aoyama, Yos. Inoue, and Yor. Inoue. Water Research, Vol 12, p 837-842, 1978. 7 fig, 1 tab, 8 ref.

Descriptors: *Mathematical models, *Simulation analysis, Food chains, Nutrient requirements, Heavy metals, Predation, Trophic level, Computer models, Mathematical studies, Fish food organisms, Food habits, Growth rates, *Bioaccumulation.

This paper proposed the food condition factor which unifies the population density and aggregation index of prey organisms from the viewpoint of the nutrition ecology in the case of modeling the concentration process of heavy metals by aquatic organisms. By using this factor we can generalize the food conditions when experiments on the biological concentration process of trace heavy metals through a food chain are performed. Simulation analysis on the concentration process of metals by a fish was made on the basis of the mathematical model described. (EIS-Deal)
W79-03467

CHROMIC ACID IN ASSIMILATION STUDIES - A CAUTION,

Colorado Univ., Boulder. Dept. of Environmental Population, and Organismic Biology.

For primary bibliographic entry see Field 5C.
W79-03468

BIOCONCENTRATION RATIO OF DIAZINON BY FRESHWATER FISH AND SNAIL,

National Inst. of Agricultural Sciences, Tokyo (Japan).

For primary bibliographic entry see Field 5C.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5B—Sources Of Pollution

W79-03483

PCB RESIDUES IN MULLET, MUGIL CEPHALUS, FED TO CAPTIVE EASTERN AUSTRALIAN WATER RATS, HYDROMYS CHRYSOGASTER,

Commonwealth Scientific and Industrial Research Organization Lyneham (Australia). Div. of Wildlife Research.

P. Woolard, and H. Settle.

Bulletin of Environmental Contamination and Toxicology, Vol 20, p 606-612, 1978. 1 fig, 3 tab, 10 ref.

Descriptors: *Polychlorinated biphenyls, *Mullets, *Pesticide residues, Rodents, Chemical analysis, Aroclors, Chlorinated hydrocarbon pesticides, Path of pollutants, Chromatography, *Australia, Pesticide kinetics, Commercial fishing, Water quality standards, *Tissue analysis, *Australian water rats.

During an investigation into levels of organochlorine pesticides in water rats, *Hydromys chrysogaster*, from an irrigation area in New South Wales, captive-raised water rats were found to contain polychlorinated biphenyl (PCB) residues. The most likely source of these residues was found to be mullet, *Mugil cephalus*, the major item of diet. The results of chromatographic analysis of fish and rat tissues for PCB levels were reported and possible paths of PCBs into fish tissues were suggested. (EIS-Deal)

W79-03484

THE TECHNICAL VARIABILITY IN BIOTIC INDICES,

University of Wales Inst. of Science and Technology, Cardiff. Dept. of Applied Biology.

For primary bibliographic entry see Field 5A.

W79-03489

5C. Effects Of Pollution

AN ASSESSMENT OF THE EFFECTS OF STORMWATER RUNOFF FROM URBAN WATERSHEDS ON THE WATER QUALITY OF A RECEIVING RESERVOIR,

Tennessee Univ., Knoxville.

S. Neperud.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 643, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, March 1978. 87 p, 9 fig, 19 tab, 20 ref, 3 append. OWRT A-043-TENN(3).

Descriptors: *Storm runoff, Water quality, Urban runoff, Urban watersheds, *Tennessee, *Stormwater, *Water quality standards, Dissolved oxygen, Total solids, *Fort Loudon Reservoir(Tenn), Reservoirs.

The purpose was to determine the effects of stormwater runoff on the water quality of Fort Loudon Reservoir. The experimental data were obtained from samples taken from Fort Loudon Reservoir before, during, and after runoff events as well as from samples taken during dry weather (control conditions). Grab samples were taken at three specific sites at one-hour intervals for the duration of the sampling period. Each sample was immediately analyzed at the Knoxville, Tennessee, Third Creek Wastewater Treatment Plant. Water quality parameters obtained were dissolved oxygen, pH, biochemical oxygen demand, conductivity, temperature, total solids, and fecal coliform bacteria. Twenty-five test runs were made. No significant water quality changes were observed between control values and those obtained after the addition of stormwater runoff into the reservoir, although for the low intensity storm monitored, the values did fluctuate a great deal. Total solids and dissolved oxygen violated stream standards on two occasions.

W79-03005

ENVIRONMENTAL ASPECTS OF CHEMICAL USE IN RUBBER PROCESSING OPERATIONS,

Research Triangle Inst., Research Triangle Park, NC. Center for Technology Applications.

For primary bibliographic entry see Field 5B.

W79-03008

CITRIC ACID ENHANCEMENT OF COPPER SULFATE TOXICITY TO THE BLUE-GREEN ALGAE APHAZOMONEN FLOS-AQUAE AND MICROCYSTIS AERUGINOSA,

Missouri Univ.-Kansas City, Dept. of Biology.

Lisa LaVaughn Ray.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 637, Price codes: A05 in paper copy, A01 in microfiche. MS Thesis, 1978. 83 p, 13 fig, 23 tab, 56 ref, append. OWRT A-099-MO(1). 14-34-0001-7053 and 7054.

Descriptors: *Copper sulfate, Citric acid, Algae, Algicide, *Cyanophyta, Toxicity, Toxicity tests, *Aphanizomenon*, *Microcystis*, Water pollution effects.

Copper toxicity tests were carried out using two species of blue-green algae, *Aphanizomenon flos-aquae* and *Microcystis aeruginosa*. Copper concentrations of 300 micrograms/liter or higher inhibited the growth of *Aphanizomenon*. The addition of 600 micrograms Cu⁺⁺/liter was the minimum copper concentration necessary to inhibit *Microcystis* growth over a 14-day experimental period. Copper solubility and cupric ion toxicity were enhanced by the addition of citric acid. Citric acid had no adverse effects on the algicidal properties of copper sulfate. A ratio of citric acid at eight times the weight of copper sulfate pentahydrate at a copper concentration of 500 micrograms/liter (8:1 citrate-copper sulfate mixture) was inhibitory to *Microcystis* growth over a 14-day period, whereas the addition of 500 micrograms Cu⁺⁺/liter alone was not. The 8:1 mixture had the same effects as the addition of 600 micrograms Cu⁺⁺/liter. The increased cupric ion toxicity was not due to a pH effect.

W79-03037

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS.

Texas Water Development Board, Austin.

For primary bibliographic entry see Field 6G.

W79-03043

EFFECT OF CARBON DIOXIDE ON PIGMENT AND MEMBRANE CONTENT IN SYNECHOCOCCUS LIVIDUS,

Massachusetts Univ., Amherst. Dept. of Microbiology.

L. S. Miller, and S. C. Holt.

Archives of Microbiology, Vol. 115, p 185-198, 1977. 24 fig, 1 tab, 33 ref. OWRT-A-069-MASS, 14-31-0001-4021

Descriptors: *Cyanophyta, *Carbon dioxide, Nutrients, *Electron microscopy, *Pigments, *Synechococcus lividus*, *Cyanobacteria, Bleaching-regreening, Chlorophyll, Water pollution effects, Thylakoid membrane, C-phycocyanin, Chlorophyll a.

The effect of carbon dioxide on pigment and membrane content in *Synechococcus lividus* was studied by depriving cells of CO₂ and examining cell populations biochemically and by electron microscopy. After 120 hr of CO₂ deprivation, *S. lividus* lost all detectable chlorophyll a and C-phycocyanin. Such bleached cultures were 'mustard yellow', the result of approximately 1.8 times more carotenoid per cell than green control cultures. Although cells from bleached cultures appeared morphologically identical to control green cells when examined by light microscopy, electron microscopic examination revealed them to be devoid of detectable thylakoid membrane. Thylakoid membrane could not be recovered by physical

isolation or revealed by freeze etching of bleached *S. lividus*. In addition, inclusion bodies characteristically found in *s. lividus* were also absent. Reintroduction of CO₂ into bleached cultures resulted in a rapid resynthesis of both chlorophyll a and C-phycocyanin. Electron microscopic examination of these regreening cultures revealed that thylakoid membrane was also rapidly resynthesized. Growth of regreened cultures did not occur until there was the synthesis of a full complement of chlorophyll a, C-phycocyanin, and thylakoid membrane. A time course study of the cytological events occurring during bleaching and regreening is presented.

W79-03102

BACTERIAL ECOLOGY OF STRIP MINE AREAS AND ITS RELATIONSHIP TO THE PRODUCTION OF ACIDIC MINE DRAINAGE,

Ohio State Univ., Columbus. Dept. of Microbiology.

W79-03104

METHYLOTROPHIC ENZYME DISTRIBUTION IN METHYLOSINUS TRICHOSPORIUM,

Ohio State Univ., Columbus. Dept. of Microbiology.

T. L. Wesver, and P. R. Dugan.

Journal of Bacteriology, Vol. 122, No. 2, p. 433-436, May 1975. 2 fig, 2 tab, 22 ref. OWRT A-027-OHIO(6).

Descriptors: *Enzymes, *Methane, Centrifugation, Distribution, Bacteria, Cytological studies, *Methylosinus trichosporium, *Methylocrophic enzyme, *Methane oxidation, *Methane fixation, Electron transport, Cytochrome, Membrane fractions, Phosphorylation.

Key enzymes involved in the oxidation and fixation of methane by *Methylosinus trichosporium* were examined for localization within the bacterial cells. A differential centrifugation scheme following cell disruption was used to provide membrane and soluble fractions for the enzyme assays. All the methylocrophic enzymes examined were found to be soluble with the fractionation scheme. Electron transport involving a cytochrome C2 with absorption peaks at 416, 522, and 550 nm and oxidative phosphorylation were found in the membrane fractions. Mixed soluble and membrane fractions coupled the oxidation of methanol and formate with cytochrome reduction. (Chao-Ohio).

W79-03105

ULTRASTRUCTURE OF METHYLOSINUS TRICHOSPORIUM AS REVEALED BY FREEZE ETCHING,

Cornell Univ., Ithaca, NY. Lab. of Microbiology.

T. L. Weaver, and P. R. Dugan.

Journal of Bacteriology, Vol. 121, No. 2, p. 704-710, February 1975. 9 fig, 12 ref. OWRT A-027-OHIO(5).

Descriptors: Methane, Membrane, Etching, Bacteria, Cytological studies, *Methylosinus trichosporium, Methane-oxidizing bacteria, *Freeze etching, Cytoplasm.

The methane-oxidizing bacterium *Methylosinus trichosporium* forms extensive intracytoplasmic membranes that lie near the cell periphery and parallel to it. These membranes enclose cavities within the cytoplasm and exist as flattened, balloon-like vesicles. The internal membranes are passed along to both cells during budding. The bacteria accumulate poly-B-hydroxybutyrate granules that lie in the center of the cells, neither within the internal membrane vesicles nor attached to them. Intercellular bridges result in the formation of chains of bacteria two to four cells in length. (Chao-Ohio).

W79-03106

LOCALIZATION OF CHITIN IN ALGAL AND FUNGAL CELL WALLS BY LIGHT AND ELECTRON MICROSCOPY,

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

Purdue Univ., Lafayette, IN. Dept. of Botany and Plant Pathology.

N. L. Pearlmuter, and C. A. Lembi.

The Journal of Histochemistry and Cytochemistry, Vol. 26, No. 10, April 1978, p 782-791, 3 fig. OWRT B-081-IND (1).

Descriptors: *Algae, *Aquatic fungi, *Chlorophyta, Cytological studies, *Pithophora oedogonia, *Blastocladiella emersonii, *Chitin.

Chitin was visualized in cell walls after hydrolysis with potassium hydroxide and subsequent postfixation of the deacetylated polysaccharide (chitosan) in OsO₄. Areas of chitin deposition appeared dark brown by light microscopy and electron dense in the electron microscope. With this method, the presence of chitin was demonstrated in the cell walls of the green alga Pithophora oedogonia (Montagne) Wittrock and two fungi, Ceratocystis ulmi Buisman (C. Moreau) and Blastocladiella emersonii Cantino and Hyatt. Most of the chitin in P. oedogonia was found in the crosswall disk and small amounts occurred in the outer longitudinal walls. The spore disk of C. ulmi also contained chitin, but significant amounts were present in the inner and outer regions of longitudinal walls as well. Chitin was present throughout the walls of B. emersonii. Small amounts of chitin were not easily demonstrated by this technique, but removal of chitosan by exposure to dilute acetic acid before osmium fixation disrupted cell wall integrity, suggesting that small amounts of the structural polysaccharide had been removed.

W79-03111

PCB AND THE HOUSATONIC RIVER - A REVIEW AND RECOMMENDATIONS, Connecticut Academy of Science and Engineering, Hartford; and Connecticut Univ., Storrs. Inst. of Water Resources.

For primary bibliographic entry see Field 5B.
W79-03114

DYNAMICS OF POLYCHLORINATED BI-PHENOLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT, PHASE 1, TASK 1, COMPILATION OF INFORMATION,

URS Co., Seattle, WA.

R. N. Dexter, S. P. Pavlou, W. G. Hines, and D.

A. Anderson.

Fish and Wildlife Service Report, April 1978. 71 p, 2 fig, 1 tab, 154 ref. 14-16-0009-78-026.

Descriptors: *Environmental effects, *Polychlorinated biphenyls, Model studies, *Mississippi River, Sediment transport, *Translocation, *Distribution, Aquatic habitats, Aquatic insects, Aquatic plants, Plankton, Benthos, Hydrology, Sediments, Water quality, Lakes, Wetlands, Rivers, Movement, Sediment transport, Path of pollutants, Bioaccumulation, Chemical partitioning, *Lake Onalaska, *Diagnostic models, *Literature surveys.

A program was undertaken by the Columbia National Fishery Research Laboratory to investigate the distribution and impact of polychlorinated biphenyls (PCBs) in the Upper Mississippi River in the vicinity of Lake Onalaska. The goal of the program is to develop a diagnostic model to show the extent of PCB contamination in the ecosystem, to identify potential factors for controlling PCBs in this area, and, most importantly, provide a capability for predicting other contaminant crises prior to occurrence. The first task, which is reported here, was to identify published and unpublished sources of information and on-going studies related to the study. The report includes an outline of the overall study, an annotated bibliography of related information, and a list of persons contacted with types of information they have available. An evaluation of the information is presented in the report subtitled, 'Task 2: Evaluation of Compiled Information'. (See W79-03119) (Little-FWS)
W79-03118

DYNAMICS OF POLYCHLORINATED BI-PHENOLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT PHASE 1, TASK 2:

EVALUATION OF COMPILED INFORMATION,

URS Co., Seattle, WA.

R. N. Dexter, W. G. Hines, E. Quinlan, and S. P.

Pavlou.

Fish and Wildlife Service Report, July 1978. 87 p, 20 fig, 4 tab, 26 ref, 1 append.

Descriptors: *Polychlorinated biphenyls, Model studies, *Mississippi River, Rivers, Lake Onalaska, Lakes, *Hydrology, Sediment transport, Flow rates, Electrical conductance, Distribution, Path of pollutants, Winds, Fish, Water circulation, Sedimentation, Water quality, Plankton, Runoff, *Environmental effects, Aquatic habitats, Aquatic animals, *Diagnostic models, *Literature reviews, Sources, Bioaccumulation, Chemical partitioning.

A program was undertaken by the Columbia National Fishery Research Laboratory to investigate the distribution and impact of polychlorinated biphenyls (PCBs) in the Upper Mississippi River in the vicinity of Lake Onalaska. The goal is to develop a diagnostic model to show the extent of PCB contamination in the ecosystem, identify potential factors for controlling PCBs in the area, and provide a capability for predicting other contaminant crises prior to occurrence. Part of the initial phase of developing the model was to evaluate the applicability of existing information identified in 'Task 1: Compilation of Information'. (See W79-03118) The analysis reported here describes the study area and considers the physical characteristics (hydrology and sedimentation) of the system and the distribution and movement of PCBs. Important observations were made regarding flow rates in the main river channel and Lake Onalaska; sediment type and movement; and PCB sources, distribution and transport. Subject areas where information is lacking were also noted. (Little-FWS)
W79-03119

ENVIRONMENTAL PREFERENCES OF SELECTED FRESHWATER BENTHIC MACROINVERTEBRATES,

Massachusetts Dept. of Environmental Quality Engineering, Westborough. Div. of Water Pollution Control.

For primary bibliographic entry see Field 5A.
W79-03128

CHANGES IN ZOOPLANKTON POPULATIONS IN THE WHITE VOLTA WITH PARTICULAR REFERENCE TO THE EFFECT OF ABATE,

Ghana Inst. of Aquatic Biology, Achimota.

J. Samman, and J. P. Thomas.

International Journal of Environmental Studies, Vol. 12, No. 3, 1978, p 207-214. 7 fig, 7 ref.

Descriptors: *Abate, *Water pollution effects, *Insecticides, *Zooplankton, *Thermocyclops hyalinus, *Lethal limit, *White Volta River, *Toxicity, *Reservoirs, *River basins, *Ghana, Volta River Basin, Simulium damnosum, Onchocerciasis, Public health, Human diseases, Copepods, Larvices, Pesticides, Vertical migration, Diel migration, Crustaceans, Cladocera, Spraying, Rivers.

Laboratory tests for toxicity determined the 24-hr LC₅₀ of the nauplii of Thermocyclops hyalinus using the insecticide Abate CE 200 (used to destroy Simulium damnosum for onchocerciasis control in the Volta River Basin) at 0.23 ppm. The 24-hr LC₅₀ of the copepod and adult stages of T. hyalinus, the dominant zooplankton in the basin, was 0.2 ppm. Pre- and post-sunset drift samples were also collected at the outflow of the reservoir created at Daboya, Ghana, where the White Volta empties into Volta Lake, December 1975-September 1976 before and after weekly aerial spraying with Abate was begun January 1976. Though the concentration of Abate introduced into the reservoir was much higher than the 24-hr LC₅₀ of T. hyalinus, the microcrustacean population appeared to be unaffected, probably because: (1) microcrustaceans drifting into the reservoir from upstream sustained reservoir populations, (2) zooplankton living at the banks of the reservoir escaped effects

of Abate flowing downstream, and (3) the spraying was done around mid-day when the majority of the zooplankton population had migrated to the bottom. Numbers of drifting zooplanktonic microcrustaceans in the White Volta increased March-July (dry season), and there was normally an increase in numbers of microcrustaceans in night samples, probably related to the vertical migration of the zooplankton in the reservoir upstream. Drift samples contained Copepoda, Cladocera, and Chaoboridae. (Lynch-Wisconsin) W79-03173

EFFECT OF AN ORGANOPHOSPHORUS INSECTICIDE, ABATE, USED IN THE CONTROL OF SIMULIUM DAMNOsum ON NON-TARGET BENTHIC FAUNA,

Ghana Inst. of Aquatic Biology, Achimota.

J. Samman, and M. P. Thomas.

International Journal of Environmental Studies, Vol. 12, No. 2, 1978, p 141-144. 1 fig, 2 tab, 10 ref.

Descriptors: *Abate, *Insecticides, *Organophosphorus pesticides, *Simulium damnosum, *Benthic fauna, *Oti River (West Africa), *Onchocerciasis, *Human diseases, *Public health, *Toxicity, *Ghana, Invertebrates, Insects, Water pollution effects, Pollutants, Pesticides, Rivers, Baetidae, Leptophlebiidae, Larvices, Spraying, Volta River Basin, River basins.

Effects of Abate, an organophosphorus insecticide, on nontarget benthic fauna were investigated in the River Oti in northern Ghana. Two of three predominating organisms, Baetidae and Leptophlebiidae, were seriously affected by the larvicide; other nontarget organisms killed included Gomphidae, Libellulidae, and Dytiscidae. Abate toxicity was relatively insignificant to other taxa, particularly Neopleria sp and Orthocladiinae. Abate is used in the Volta River Basin in the Onchocerciasis Control Program to destroy the disease-carrying organism Simulium damnosum. Previous studies of the effect of Abate on nontarget organisms have produced inconsistent results. In this study Abate CE 200 was sprayed from the air on the river near its point of entry into Volta Lake. A surber sampler was used to collect predosing samples on 22 March 1977 from 2:00-5:00 pm at two sites, one covered by flat-surfaced rock (Site R) and one made up of gravels (Site G). The insecticide was sprayed from 400 m at 9 am on 23 March 1977, and postdosing samples were collected 2-4 pm the same day. Dosage at the sampling site was estimated at 0.01-0.05 ppm for about 30 min. More taxa and numbers were collected from Site G than from Site R. The presence of several taxa only at the former site indicates a lack of uniformity in distribution of benthic invertebrates in the riverbed. (Lynch-Wisconsin)

W79-03174

EFFECTS OF CHROMIUM ON SOME AQUATIC PLANTS,

Environmental Assessment Council, Inc., New Brunswick, NJ.

J. Mangi, K. Schmidt, J. Pankow, L. Gaines, and P. Turner.

Environmental Pollution, Vol. 16, No. 4, p 285-291, August 1978. 4 fig, 8 ref.

Descriptors: *Chromium, *Water pollutant effects, *Algae, *Duckweed, *Toxicity, *Susquehanna River, *Bioaccumulation, New York, Plant growth, Absorption, Pollutants, Aquatic plants, Rivers, Ecosystems, Lemma minor, Chlorophyta, Spirodela polyrrhiza, Palmella mucosa, Oedogonium, Hydrodictyon reticulatum, Palmelloccoccus protothecoides.

Chromium, as Cr(VI), CrO₄(=), was moderately toxic to four riverine chlorophyte algal species, and less so to two duckweed species (Lemma minor and Spirodela polyrrhiza). Samples collected primarily in the upper Susquehanna River in New York at the Pennsylvania border were supplemented by algal samples from the Tioughnioga and Chenango rivers. Algal species included Palmella mucosa, Oedogonium sp, Hydrodictyon reticulatum, and Palmelloccoccus protothecoides. Accumu-

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

lution of chromium by living and dead plant tissue was extensive and could have important effects on the river ecosystem. Growth of all plants was inhibited by 10 ppm chromium. Unicellular algae (*Palmella* and *Palmettoccus*) declined in cell numbers after two weeks, while the filamentous forms (*Oedogonium* and *Hydrodictyon*) showed weight loss. Both duckweed species grew during the two weeks, but less so than in control. Among algae, a percentage of healthy looking cells and filaments remained amid the bleached, distorted ones. Effects of lower chromium doses were mixed, though uptake was approximately linearly correlated with background concentration. Since chromium was taken up by dead cells, absorption appears largely responsible for uptake; much of the chromium was localized on cell walls. Under laboratory conditions enough chromium is absorbed to detoxify the medium, which appears to allow some cells to survive and reestablish the population. Outermost cells may remove enough chromium to protect inner cells. (Lynch-Wisconsin)
W79-03176

CHANGES IN THE AQUATIC MACROPHYTE FLORA OF WHITEWATER LAKE NEAR SUDBURY, ONTARIO FROM 1947 TO 1977,

Guelph Univ. (Ontario). Dept. of Botany and Genetics.

H. M. Dale, and G. E. Miller.

The Canadian Field-Naturalist, Vol. 92, No. 3, p 264-270, July-September 1978. 1 fig, 3 tab, 12 ref.

Descriptors: *Macrophytes, *Whitewater Lake(Ontario Canada), *Water pollution effects, *Bioindicators, *Urban runoff, *Mine wastes, *Municipal wastes, Industrial wastes, Storm drains, Lakes, Ontario(Canada), Canada, Abundance, Water crowfoot, *Ranunculus trichophyllus*, *Myriophyllum exaltatum*, Potamogeton amplifolius, Potamogeton gramineus, Potamogeton natans, Potamogeton praelongus, Floating heart, *Nymphaea cordatum*, Water marigold, *Megalodonta beckii*, *Heteranthera dubia*, *Pontederia cordata*.

Comparison of a June-July 1977 survey of macrophytes in Whitewater Lake, near Sudbury, Ontario, Canada, with a survey conducted by Soper in 1947 before the lake was enriched and disturbed by recent release of municipal and industrial effluents shows that several species have decreased in abundance, five are now extinct, and only two have increased significantly. Of four new species recorded, two were rare and two were probably misidentified in 1947. Species now apparently extinct are wild rice (*Zizania aquatica*), lesser duckweed (*Lemna minor*), and Potamogeton foliosus, all rare in 1947, and floating heart (*Nymphaea cordatum*) and water marigold (*Megalodonta beckii*), both abundant in 1947. Species abundant in 1977 but rare or occasional in the earlier survey are water star grass (*Heteranthera dubia*) and pickerel weed (*Pontederia cordata*). The increase in water star grass appears due to its greater tolerance combined with reduced competition from other species. Six species can be classed as indicators based on their adverse reaction to the waste effluents: water crowfoot (*Ranunculus trichophyllus*), North American water milfoil (*Myriophyllum exaltatum*), and four pondweeds (*Potamogeton amplifolius*, *P. gramineus*, *P. natans*, and *P. praelongus*). Storm drains from the village of Azilda discharge into the lake, which also receives indirect drainage high in copper, nickel, and iron (and with a pH of 7.8) from a mining operation tailings dump. (Lynch-Wisconsin)
W79-03177

ECOLOGICAL STUDIES ON INDONESIAN LAKES, THE MONTANE LAKES OF BALI,

Cambridge Univ. (England). Dept. of Biology.
J. Green, S. A. Corbet, E. Watts, and O. B. Lan.

Journal of Zoology, Vol. 186, No. 1, September 1978, p 15-38, 6 fig, 7 tab, 19 ref.

Descriptors: *Bali(Indonesia), *Eutrophication, *Danau Bratan(Indonesia), *Danau Batur(Indonesia), *Danau Buyan(Indonesia), *Danau Tamblingan(Indonesia), *Mountain lakes, Limnology, Phytoplankton, Zooplankton, Water

chemistry, Indonesia, Islands, Lakes, Mountains, Ecology, Guppies, *Poecilia reticulata*, Aquatic plants, Fisheries, Urbanization, Water pollution effects, Conductivity, Hydrogen ion concentration, Biological communities, Invertebrates, Alpine.

our Balinese Mountain lakes were surveyed 15-25 August 1974, two of which (Danau Bratan at 1231 m and Danau Batur at 1031 m) were studied in 1929 by the German Sunda Expedition. While Danau Batur, larger than Danau Bratan (15.9 vs 3.8 sq km) and with very high conductivity (1650 micromho/cm at 20°C), showed little change since 1929, unproductive Danau Bratan, with very low conductivity (39 micromho/cm), showed changes in water chemistry and plankton composition which may reflect slight cultural eutrophication. The previously unstudied lakes, Danau Buyan and Danau Tamblingan (both at 1214 m), lie in the same caldera as Danau Bratan; water quality of all three lakes appears similar to 1929. If so, Danau Tamblingan has hardly changed, Danau Buyan has changed little, and Danau Bratan has changed much more. The latter has been subjected to the heaviest human pressure, followed by Danau Buyan and inaccessible Danau Tamblingan; Danau Batur is being developed as a tourist center. The three adjacent lakes are contrasted in terms of stability of stratification, plankton composition, vegetation, marginal fauna, guppy diet, and fisheries, and differences are related to wind exposure and effects of human settlement. Changes in Danau Bratan since 1929 include: (1) doubling of conductivity from 18 to 39 micromho/cm, (2) a pH change from 6.8 to 7.1, (3) end of desmid dominance of phytoplankton, and (4) marked zooplankton species composition changes. (Lynch-Wisconsin)
W79-03180

ON NUTRIENTS AND THEIR ROLE AS PRODUCTION LIMITING FACTORS IN THE BALTIC,

Fishery Board of Sweden, Goteborg, Inst. of Marine Research.

S. H. Fonselius.

Acta Hydrochimica et Hydrobiologica, Vol. 6, No. 4, 1978, p 329-339, 10 fig, 8 ref.

Descriptors: *Baltic Sea, *Nutrients, *Limiting factors, *Eutrophication, *Primary productivity, *Organic matter, Seas, Phytoplankton, Deep water, Halocline, Algae, Phosphorus, Nitrogen, Ammonia, Phosphates, Hydrogen sulfide, Trophic level, Water pollution effects, Sewage treatment, Oxygen depletion, Anaerobic conditions, Aerobic conditions.

The reason for increasing eutrophication in the Baltic Sea may be alternating oxic and anoxic conditions, and phosphate may be the most limiting factor for phytoplankton production. Nitrogen is always available, for example as ammonia. The Baltic is a semienclosed basin with a positive water balance; oxygen in deep water becomes depleted and nutrients accumulate. Deep water oxygen conditions are regulated by the water exchange ratio in the Danish sounds, in the supply of organic matter, and the oxidation rate. Organic matter is brought in by river water, inflowing bottom water from the Kattegatt, precipitation, and effluents, and is produced by the sea itself through biological processes. Biological production is regulated by sunlight, light penetration, temperature, supply of nutrient salts, vitamins, hormones, trace metals, and other factors. A previous study showed only 10% of annual organic matter supply in the sea would produce anoxic conditions in deep water below the halocline. The Baltic has very low surface water nutrient levels but large concentrations in deep water. Hydrogen sulfide is formed and phosphate is dissolved from sediments during anoxic periods, and with return of oxic conditions sediment phosphorus is again renewed through precipitation of iron phosphate. With inflow of new water to deep areas, accumulated nutrients are washed to the surface through thermohaline convection, causing surface fertilization. (Lynch-Wisconsin)
W79-03182

ASSESSING CHANGES IN BIOMASS OF RIVERBED PERIPHYTON,

Guelph Univ. (Ontario). Dept. of Zoology.

W. K. Liaw, and H. R. MacCrimmon.

Internationale Revue der Gesamten Hydrobiologie, Vol. 63, No. 2, 1978, p 155-171, 4 fig, 14 tab, 19 ref.

Descriptors: *Periphyton, Rivers, *Grand River(Ontario Canada), *Benthic flora, *Artificial substrates, *Methodology, River beds, Algae, Biomass, Riffles, Ontario(Canada), Canada, Organic matter, Primary productivity, Substrates, Suspended solids, Speed River(Ontario Canada), Scour, Respiration, Grazing, Chlorophyll, Detritus, Invertebrates.

Measurement of losses and gains of periphyton in a downriver riffle of the Grand River, a large river in Ontario, Canada, using concrete blocks and attached glass slides as substrates, showed that periphyton is a significant source of suspended organic matter in rivers of relatively unwooded basins. Concrete blocks were better as a substrate than glass slides; periphyton was well-established on the blocks toward the end of the study period (May-December 1971), similar to that on native rocks in terms of biomass, carbon and nitrogen content, and ratio of biomass to chlorophyll-a. Average accumulation rate of periphyton on glass slides (which were replaced monthly) was 266.2 mg/sq m/day ash-free wt, 120.9 carbon, 20.4 nitrogen, and 1.11 chlorophyll-1. On concrete blocks average accumulation rate was 590.0 mg/sq m/day ash-free wt, 202.9 carbon, 22.8 nitrogen, and 2.95 chlorophyll-a. Standing biomass of periphyton on glass slides varied from 0.7 g/sq m in December to 21.6 g/sq m May-June, with an average of 8.6 g/sq m. On concrete blocks biomass ranged from 29.9 g/sq m in October to 132.5 g/sq m in August, with a mean of 66.1 g/sq m. Comparison of biomass of periphyton on slides and on concrete blocks provided an estimated of the average rate of loss (from scour, respiration, and grazing) of periphyton from concrete blocks at 2.9 g/sq m/day, which is 63% of the mean total accumulation rate of the periphyton. (Lynch-Wisconsin)
W79-03183

SOME FACTORS AFFECTING ON DRY WEIGHT, ORGANIC WEIGHT AND CONCENTRATIONS OF CARBON AND NITROGEN IN FRESHLY PREPARED AND IN PRESERVED ZOOPLANKTON,

Scripps Institution of Oceanography, La Jolla, CA. For primary bibliographic entry see Field 5A.
W79-03184

DISTRIBUTION AND ABUNDANCE OF PHYTOPLANKTON IN 153 LAKES, RIVERS, AND POOLS IN THE NORTHWEST TERRITORIES,

Canada Environmental Protection Service, Yellowknife (Northwest Territories).

J. W. Moore.

Canadian Journal of Botany, Vol. 56, No. 15, August 1978, p 1765-1773, 2 fig, 2 tab, 47 ref.

Descriptors: *Lakes, *Rivers, *Temporary pond stage, *Phytoplankton, *Northwest Territories(Canada), *Basic data collections, *Distribution, *Abundance, *Arctic, *Cold regions, Algae, Ponds, Canada, Dinobryon baroricum, Dinobryon cylindricum, Dinobryon sociale, Dinobryon divergens, Cyclotella glomerata, Cyclotella ocellata, Diatoms, Great Slave Lake(Northwest Territories Canada), Great Bear Lake(Northwest Territories Canada), Mackenzie River(Northwest Territories Canada).

Phytoplankton were surveyed 1975-77 in 153 lakes, rivers, and temporary pools in Canada's Northwest Territories, an area lying above a latitude of about 55 degrees and comprising the largest expanse of freshwater in the world. Dinobryon baroricum was the most abundant and widespread species, occurring in almost all collections, followed by D. cylindricum, D. sociale, and D. divergens. Predominant diatoms were Cyclotella glomerata and C. ocellata, both of which reached greatest abundance in lakes and rivers of the high arctic and were

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

completely absent from temporary pools (a distribution almost certainly related to turbulence). Although *Asterionella formosa*, *Diatoma tenuis* var. *elongatum*, and *Melosira islandica* were common in Great Slave Lake and other southern lakes, they were rare or absent north of latitude 65 degrees. Chlorophyta (particularly *Ankistrodesmus falcatus* and *Scenedesmus* spp.) occurred in almost all collections but always in low numbers. Planktonic Cyanophyta, primarily *Oscillatoria limnetica*, were normally rare. Most samples were collected in the western arctic and subarctic, with additional collections in the arctic archipelago as far north as Ellesmere Island. Collections were usually made at 5-depth intervals to maximum depth. The predominance of *Dinobryon* spp. parallels phytoplankton records of Alaska, Scandinavia, and the Quebec-Labrador Peninsula. Densities of dominant algae in this study were considerably lower than in northern and alpine Europe, central Canada, and Alaska. (Lynch-Wisconsin)
W79-03185

ORGANIC CARBON-A NONSPECIFIC WATER QUALITY INDICATOR FOR LAKE SUPERIOR,
Minnesota Univ., Minneapolis. Dept. of Civil Mineral Engineering.
For primary bibliographic entry see Field 5A.
W79-03186

A METHOD FOR THE ANALYSIS OF ENVIRONMENTAL FACTORS CONTROLLING PATTERNS OF SPECIES COMPOSITION IN AQUATIC COMMUNITIES,
Manitoba Univ., Winnipeg. Dept. of Zoology.
R. H. Green, and G. L. Vasotto.
Water Research, Vol. 12, No. 8, 1978, p 583-590. 3 fig, 3 tab, 61 ref.

Descriptors: *Methodology, *Analytical techniques, *Species composition, *Cluster analysis, *Classification, *Lakes, *Zooplankton, Ontario(Canada), Canada, Environmental effect, Parameters, Water chemistry, Statistical models, Model studies, Computer models, Pollutants, Water pollution effects, Species diversity, Diversity indices.

Analytical methods for determining effects of environmental parameters on biological species composition are analyzed: (1) methods which reduce biological data, such as species abundance, to a more usable form (including ordination and classification methods, and diversity indices); and (2) methods which relate these reduced data to environmental data. The procedure recommended is classification (or cluster) analysis of biological data followed by multiple discriminant analysis of species assemblage groups on the environmental variables. An example illustrating the procedure is given, applications of these methods to pollution studies is discussed, and possible modifications and extensions are considered. The example utilizes data from Patalas (1971) on abundance of 27 zooplankton species in 34 lakes in northwestern Ontario, Canada. Values for 11 morphometric and chemical variables in each lake were obtained from two published sources; variables included area, maximum depth, conductivity, total dissolved solids, calcium, magnesium, sodium, potassium, iron, nitrogen, and phosphorus. Results may show a pollution species assemblage whose samples are located only in the impact part of the study area and are separated from other species assemblage groups by a discriminant function with high coefficients only on the pollutant variables. (Lynch-Wisconsin)
W79-03187

ECOLOGICAL GENETICS OF TROUT ADAPTED TO GEOTHERMALLY HEATED WATERS OF YELLOWSTONE PARK,
Montana State Univ., Bozeman. Dept. of Biology.
D. G. Cameron, E. R. Vyse, and D. Browne.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 766, Price codes: A03 in paper copy, A01 in microfiche. Montana University Joint Water Resources Research Center, Montana State University, Research

Report Number 97, October 1978. 31 p. OWRT A-107-MONT(1), 14-34-0001-8028.

Descriptors: Fish environment, *Water temperature, *Fish genetics, *Enzymes, Fish behavior, Environmental effects, Proteins, Montana, Wyoming, *Thermal water, *Rainbow trout, Firehole River(Mont), *Yellowstone Park, Isozymes, Alleles, Heterozygosity, Reproduction.

The electrophoretic mobility of proteins extracted from tissues of rainbow trout inhabiting highly atypical thermal regimes with water temperatures reaching 29.5 degrees C was measured. Measured levels of heterozygosity (H) and allelic homologies in these fish were not significantly different from those found in cold water and hatchery rainbow trout of South Central Montana. As no unique alleles could be inferred from the products of the 6 polymorphic loci in the fish of the warmer waters, no genetic adaptation was apparent. Concurrent laboratory work failed to indicate any unusual heat tolerance, and the lack of apparent evolutionary change suggests these fish survive at the physiological limits of their heat tolerance. (Hunt-Montana)
W79-03307

MICROBIAL SULFUR CYCLE ACTIVITY AT A WESTERN COAL STRIP MINE,
Montana State Univ., Bozeman. Dept. of Microbiology.
For primary bibliographic entry see Field 5B.
W79-03308

ENVIRONMENTAL ASPECTS OF A WELL BLOWOUT IN THE GULF OF MEXICO,
Texas A and M Univ., College Station. Dept. of Oceanography.

J. M. Brooks, B. B. Bernard, T. C. Sauer, Jr., and J. Abel-Reheim.
Environmental Science and Technology, Vol. 12, No. 6, p 695-703, June 1978. 11 fig, 4 tab, 18 ref.

Descriptors: *Environmental effects, *Gases, *Water pollution, *Blowouts, Sediments, *Gulf of Mexico, Resources development, *Outer Continental Shelf, *Natural seeps, Hydrocarbons.

Studies were conducted around a well blowout site on the Texas continental shelf that resulted in the escape of large quantities of gas and creation of a crater 95 m deep and 500 m wide. Four months after the blowout a plume of suspended sediment and gas continued to emanate from the crater at a seep rate of $10 \times 10,000,000 \text{ L/day}$. At this time molecular and isotopic analyses of the seeping gas indicated that the gas was principally of biogenic origin (predominantly methane and delta 13C of -600/oo) and not accompanied by any brine seepage. The seep gas did, however, contain a small thermocatalytic component as evidenced by the C1/(C2+C3) ratio and its liquid hydrocarbon content (1.23 mg/L). Measurements of gaseous and liquid hydrocarbons dissolved in the water in the vicinity of the seep indicated rapid dilution of the high concentrations observed over the plume. The depth to which sediments were redeposited around the crater was determined by carbon isotope measurements on the carbonate fraction of the sediment. Analysis of hydrocarbons in redeposited sediments indicated that the original blowout gas was of predominantly thermocatalytic origin, containing higher concentrations of C2-C14 hydrocarbons than are presently seeping from the blowout. The impact of the blowout on temperature, salinity, dissolved oxygen, DOC, POC, TSM, helium, CO2, SigmaCO2, and sulfate in the waters and sediment near the crater is also discussed. (Sinha-OEIS)
W79-03362

HYDROCARBONS IN THE MARINE ENVIRONMENT OF PORT VALDEZ, ALASKA,
Alaska Univ., Fairbanks. Inst. of Marine Science.
D. G. Shaw, and B. A. Baker.
Environmental Science and Technology, Vol. 12, No. 10, p 1200-1205, October 1978. 1 fig, 5 tab, 19 ref.

Descriptors: *Alaska, *Biota, *Sediments, *Oil pollution, Resources development, Water pollution, Baseline studies, Environmental effects, Outer Continental Shelf, Hydrocarbons, Natural seeps, *Port Valdez(AK).

Saturated and unsaturated hydrocarbons were quantitatively determined in biota, water and sediments of Port Valdez, Alaska. These analyses show kinds and amounts of hydrocarbons typical of unpolluted nearshore marine environments. Common, prominent compounds include pristane, heptadecane, odd chain length normal alkanes with 21-31 carbon atoms, and a triterpene tentatively identified as squalene. Environmental samples for this work were collected during the period of approximately one year prior to the completion of the trans-Alaska oil pipeline. The operation of a tanker loading facility associated with that pipeline at Valdez will result in a controlled input of petroleum into Port Valdez. The results presented here provide a basis from which to investigate the fate of that added oil. (Sinha-OEIS)
W79-03366

ACCUMULATION OF SATURATED HYDROCARBONS IN TISSUES OF PETROLEUM-EXPOSED MALLARD DUCKS (ANAS PLATYRHYNCHOS),
New Orleans Univ., LA. Center for Bio-Organic Studies.

G. C. Lawler, W. Loong, and J. L. Laseter.
Environmental Science & Technology, Vol. 12, No. 1, p 47-54, January 1979. 3 fig, 1 tab, 20 ref.

Descriptors: *Oil pollution, *Pollution effects, *Ducks(Wild), *Laboratory tests, Resources development, Water pollution, Environmental effects, Hydrocarbons, Anas platyrhynchos.

Mallard drakes were dosed with 5 mL a day of South Louisiana crude oil for 14 days. Tissues from control and experimental ducks were then examined for petroleum hydrocarbons by combined high-resolution gas chromatography and mass spectrometry. Three characteristics of the saturated hydrocarbon fraction were used to assess the presence of crude oil: the n-alkane distribution pattern, the presence of homologous series of petroleum-derived hydrocarbons, and the n-C17/pristane ratio. Oil was found in every experimental tissue examined but the brain. The skin (and underlying adipose tissue) contained the highest level of saturated petroleum hydrocarbons. The other tissues were ranked related to the skin as follows: skin goes to uropygial gland goes to breast muscle, goes to heart muscle goes to liver goes to brain. The blood contained low levels of petroleum-derived hydrocarbons 3-4 hr after the final dose of crude oil. That saturated petroleum hydrocarbons did not accumulate in the duck tissues in the same relative amounts observed in South Louisiana crude oil suggested selective uptake and/or metabolism. (Sinha-OEIS)
W79-03367

DISTRIBUTION OF POLYCHLORINATED BI-PHENYLS (PCB) IN ESTUARINE ECOSYSTEMS. TESTING THE CONCEPT OF EQUILIBRIUM PARTITIONING IN THE MARINE ENVIRONMENT,
URS Co., Seattle, WA.

For primary bibliographic entry see Field 5B.
W79-03369

LIGHT HYDROCARBONS IN RECENT TEXAS CONTINENTAL SHELF AND SLOPE SEDIMENTS,
Texas A and M Univ., College Station. Dept. of Oceanography.
For primary bibliographic entry see Field 5B.
W79-03371

TMP (THERMOMECHANICAL PULPING) EFFLUENTS - A REVIEW,
Pulp and Paper Research Inst. of Canada, Pointe Claire (Quebec).
A. Wong, D. Breck, and J. Costantino.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

Tappi, Vol. 61, No. 8, p. 19-22, August, 1978. 3 fig. 14 ref. 3 tab.

Descriptors: *Pulp wastes, *Toxicity, *Biochemical oxygen demand, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Pine trees, Fir trees, Spruce trees(Picea), *Thermomechanical pulping.

The state-of-the-art of thermomechanical pulping (TMP) effluents is summarized as follows: The toxicity of TMP effluents is species-dependent; pine effluent is more toxic than spruce or fir effluent and softwood effluent is more toxic than hardwood effluent. For a given wood species and age of wood since felling, effluent toxicity is not affected by TMP conditions. Unlike toxicity, the BOD of TMP effluents is not dependent on species. BOD loading is slightly more dependent on TMP conditions than toxicity. High steam pressure will give a higher BOD loading and a lower pulp yield. For a given species, the toxicities and BOD loadings of TMP and stone groundwood effluents are comparable. Most of the toxicity and BOD appear to be released in the first stage of a 2-stage TMP system. The chip washing operation, plug screw feeder effluent, and pulp cyclone condensate contribute insignificant loadings of toxicity and BOD to the total TMP effluent. (Swichtenberg-IPC) W79-03414

LAKE QUALITY DISCRIMINANT ANALYSIS, Michigan State Univ., East Lansing. Dept. of Resource Development.

K. Reckhow.

Water Resources Bulletin, Vol. 14, No. 4, p 856-867, August 1978. 3 fig, 2 tab, 13 ref.

Descriptors: *Water quality control, *Lakes, *Eutrophication, *Discriminant analysis, *Phosphorus, Dissolved oxygen, Equations, Oxidative-anoxic transition point, Estimating, Probability, Prediction, Model studies, Systems analysis.

Despite the fact that lake phosphorus loading criteria have proven to be valuable tools in lake management, they are generally subjective in nature or incomplete in form. In order to address these shortcomings, the oxidative-anoxic transition point was selected as an objective quality criterion and discriminant analysis was used to construct a lake classification junction. This function is dependent upon lake phosphorus loading, mean depth, and overflow rate. The value of the function may be expressed as a probability of classification (as either oxidized or anoxic). When used in prediction, inclusion of the input error permits the estimation of the change in classification probability as input uncertainty is reduced. Further, the form of the discriminant function suggests that the annual volumetric loading is a more informative term for the expression of phosphorus loading than is the annual areal loading. (Bell-Cornell) W79-03422

EMISSION OF MICROBIAL AEROSOLS FROM POLLUTED WATERS IN DENSELY POPULATED REGIONS, Kentucky Water Resources Research Inst., Lexington.

For primary bibliographic entry see Field 5A. W79-03438

A STUDY OF NITRIFICATION IN THE DELAWARE RIVER ESTUARY, Rutgers - The State Univ., New Brunswick, NJ. Dept. of Environmental Science.

For primary bibliographic entry see Field 5B. W79-03439

EFFECTS OF ARSENATE ON GROWTH AND PHOSPHORUS METABOLISM OF PHYTOPLANKTON, Fisheries and Marine Service, Winnipeg (Manitoba).

D. Planas, and F. P. Healey.

Journal of Phycology, Vol. 14, p 337-341, 1978. 2 fig, 2 tab, 30 ref.

Descriptors: *Arsenic compounds, *Metabolism, *Phytoplankton, *Toxicity, *Growth rates, Phosphorus, Cytological studies, Aquatic algae, Ochromonas, Chlamydomonas, Anabaena, Mortality, Biochemistry, Absorption, Phosphates, Photosynthesis, Respiration, *Arsenate, Melosira, Cryptomonas.

The response to arsenate in growth and phosphate uptake by five algae in culture varied considerably. The growth rates of Melosira granulata and Ochromonas vallesiacae were depressed by 1 microM arsenate. Chlamydomonas reinhardtii required 10 microM for the same degree of depression, while the growth rates of Cryptomonas erosa and Anabaena variabilis were unaffected up to 100 microM. However, following depletion of phosphate, cultures of the latter two algae began to die at the higher concentration of arsenate tested. Growth of C. reinhardtii in the presence of 35 microM arsenate resulted in characteristics of P deficiency. Comparison of rates of photosynthesis, respiration, and phosphate uptake between cultures of C. reinhardtii which had grown in the presence and absence of arsenate showed little evidence after 16 doublings that it had adapted to arsenate. (EIS-Deal) W79-03443

COEXISTENCE OF TOXIC AND NONTOXIC DINOFAGELLATES RESEMBLING GONYAULAX TAMARENSIS IN NEW ENGLAND COASTAL WATERS (NW ATLANTIC), Bigelow Lab. for Ocean Sciences, West Boothbay Harbor, ME.

C. M. Yentsch, B. Dale, and J. W. Hurst. Journal of Phycology, Vol. 14, p 330-332, 1978. 1 fig, 1 tab, 9 ref.

Descriptors: *Algal toxins, *Red Tide, *Dinoflagellates, Toxicity, Aquatic populations, Shellfish, Bottom sediments, Growth stages, Systematics, Classification, Plankton, Biochemistry, Bioassay, Chemical analysis, New England, Gonyaulax.

Two forms resembling Gonyaulax tamarensis coexist in Maine coast plankton; one is toxic, the other is nontoxic. At times, red patches of dinoflagellates were identified as G. tamarensis, yet only presumed to be toxic. These two forms are not easily distinguished by conventional microscopic observations, nor by pigment analysis. Preliminary observations suggest that the nontoxic form is smaller than G. excavata and lacks the 'excavated' ventral region. Characteristic G. excavata resting cysts were found in sediments from the shellfish toxic area off Newagen and Monahen (Maine) and were not found in sediments from areas where the nontoxic form bloomed. There appear to be a minimum of two G. tamarensis-like organisms. Full systematic treatment of these must await further information. (EIS-Deal) W79-03444

CALCIFICATION AND CATION SORPTION OF CLADOPHORA GLOMERATA (CHLOROPHYTA), Wisconsin Univ., Milwaukee. Center for Great Lakes Studies.

C. S. Sikes.

Journal of Phycology, Vol. 14, p. 325-329, 1978. 2 fig, 1 tab, 53 ref.

Descriptors: Chlorophyta, *Calcium, *Absorption, *Metabolism, *Cladophora, *Cation adsorption, Calcium carbonate, Carbon dioxide, Photosynthesis, Enzymes, Biochemistry, Membrane processes, Cations, Bicarbonates, Chemical reactions, Growth rates, Aquatic algae, Strontium, Radioactivity techniques, Pectin.

Calcium sorption by Cladophora glomerata grown in continuous-flow culture increased substantially as the alga aged. This reflected increased pectin layered in thickening cell walls followed by deposition of CaCO₃ around cells. The high levels of pectin may account for the plant's reported high affinity for cations. The onset of carbonate deposition coincided with the appearance of carbonic anhydrase activity in cells. This suggests that car-

bionate deposition may be a function of bicarbonate use as a source of CO₂ for photosynthesis. Calcium uptake appears to occur by active transport in that it exhibited saturation kinetics, occurred against a concentration gradient, depended on light, and was nearly abolished by treatments that allow diffusion. Although strontium competed for Ca for binding sites of pectin, it did not inhibit internal transport of Ca. Consequently, the proposed carrier may be specific for Ca. (EIS-Deal) W79-03445

TOXICITY OF BISULFITE TO PHOTOSYNTHESIS AND RESPIRATION, Montana Univ., Missoula. Dept. of Biology. R. P. Sheridan.

Journal of Phycology, Vol 14, p 279-281, 1978. 3 fig, 12 ref.

Descriptors: *Toxicity, *Photosynthesis, *Respiration, Inhibitors, Sulfur compounds, Growth rates, Water pollution effects, Air pollution effects, Metabolism, Aquatic algae, Phytoplankton, Industrial wastes, *Bisulfite, *Sulfur dioxide, Chlorococcum.

Inhibition of photosynthesis in Chlorococcum sp. by bisulfite ion was the reciprocal of the light intensity curve. Respiration was least affected by bisulfite after endogenous substrate was reduced by incubation in darkness. Maximum reduction in growth occurred with bisulfite treatment at or above optimal growth temperatures. Maximum phytotoxicity correlated with conditions resulting in maximum metabolic activity. (EIS-Deal) W79-03446

TOXICITY IN RESTING CYSTS OF THE RED-TIDE DINOFAGELLATE GONYAULAX EXCAVATA FROM DEEPER WATER COASTAL SEDIMENTS, Oslo Univ. (Norway). Dept. of Marine Biology and Limnology.

B. Dale, C. M. Yentsch, and J. W. Hurst. Science, Vol. 201, p. 1223-1225, 1978. 2 fig, 8 ref.

Descriptors: *Red tide, *Algal toxins, *Dinoflagellates, *Toxicity, *Bottom sediments, Growth stages, Commercial shellfish, Eutrophication, Human pathology, Animal pathology, Mortality, Algal poisoning, Food chains, Dredging, Gonyaulax, Saxitoxin.

For the first time, Gonyaulax excavata cysts have been shown to be toxic. Bottom sediments from a water depth of 90 meters off the Maine coast were extremely rich in cysts, which were approximately ten times more toxic than the corresponding motile stages. Cysts are probably ingested by shellfish, thereby causing shellfish toxicity in deeper water offshore and contributing to shellfish toxicity in shallower coastal waters. A new approach to the problem of paralytic shellfish poisoning is therefore needed, one that takes into account benthic cysts and sedimentary factors affecting their distribution. The possible dangers of spreading poison through human activities must be considered. (EIS-Deal) W79-03447

ENDRIN AND MALATHION TOXICITY TO FLAGFISH (JORDANELLA FLORIDA), Environmental Research Lab.-Duluth, MN. R. O. Hermanutz.

ARCHIVES of Environmental Contamination and Toxicology, Vol. 7, p. 159-168, 1978. 1 fig, 4 tab, 16 ref.

Descriptors: *Pesticide toxicity, *Endrin, *Bioassay, *Insecticides, Mortality, Growth rates, Fish reproduction, *Toxicity, Chemical properties, Pesticide residues, Juvenile growth stage, Organophosphorus pesticides, Chlorinated hydrocarbon pesticides, Water pollution effects, *Malathion, *Flagfish, Jordanelle.

Endrin and malathion effects on survival, growth, and reproduction of flagfish were determined in a flow-through system. Endrin chronic effects on first-generation growth and reproduction occurred

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Effects Of Pollution—Group 5C

only at 0.3 microg/l, the highest concentration tested. The mean endrin residues in the first-generation fish at 65 days were about 15,000 times the water concentrations tested. Malathion concentration of 31.5 microg/l and 24.7 microg/l, the highest concentration tested, had detrimental effects on first-generation survival. During the same period malathion concentration as low as 10.9 microg/l significantly affected growth. Neither insecticide, at the concentrations tested, had any detectable effects on the second generation during a 30-day exposure period. Acute toxicities to juvenile fish was also determined in the same flow-through system. (EIS-Deal)
W79-03448

THE BIOGEOCHEMISTRY OF HEAVY METALS IN POLLUTED LAKES AND STREAMS AT FLIN FLON, CANADA, AND A PROPOSED METHOD FOR LIMITING HEAVY-METAL POLLUTION OF NATURAL WATERS,

Fisheries and Marine Service, Winnipeg (Manitoba), Freshwater Inst.

T. A. Jackson.
Environmental Geology, Vol. 2, No. 3, p. 173-189, 1978. 14 fig, 6 tab, 70 ref.

Descriptors: *Heavy metals, Effluents, *Waste treatment, *Zinc, *Cadmium, *Copper, *Mercury, *Iron, Mine wastes, Industrial wastes, Geochemistry, Biochemistry, Chemical analysis, Eutrophication, Bottom sediments, Sewage effluents, Aquatic algae, Seston, *Smelter wastes.

The biogeochemistry of Zn, Cd, Cu, Hg, and Fe in lakes and streams polluted by mines and smelter wastes emitted at Flin Flon, Canada, was investigated. In Chisht Lake, a repository for both tailings-pond drainage and sewage, green algal blooms generated by nutrients from sewage promote entrapment of metals in sediments by (1) accumulation of metals from solution by algal seston, with preferential uptake of Zn, the most abundant metal, followed by sinking of the seston; and (2) production of H₂S during decomposition of dead algae, resulting in sulfide precipitation. Metals are partially resolubilized from seston as it decomposes while sinking. In bottom muds, partitioning of a metal between sulfide and organic matter is strongly dependent on the stability of the metal sulfide as measured by its standard entropy. Metals were concentrated in H₂S-rich muds and extraction of muds with various solvents and by electrodialysis showed that sulfide was much more effective than organic matter in suppressing remobilization of metals. These results indicate that introduction of sewage together with heavy-metals effluents into settling ponds could be an effective and economic method for limiting heavy-metal pollution of natural waters. (EIS-Deal)
W79-03449

TEST ORGANISMS AND METHODS USEFUL FOR EARLY ASSESSMENT OF ACUTE TOXICITY OF CHEMICALS,

Dow Chemical, Midland, MI. Health and Environmental Research.

For primary bibliographic entry see Field 5A.
W79-03450

REQUIREMENT OF RAINBOW TROUT FOR DIETARY ZINC,

Tokyo Univ. of Fisheries. (Japan). Lab. of Fish Nutrition.

O. Ogino, and G. -Y. Yang.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 44, No. 9, p. 1015-1018, 1978. 2 fig, 6 tab, 5 ref.

Descriptors: *Rainbow trout, *Zinc, *Fish diets, Fish physiology, Trace elements, Metals, Water chemistry, Fish diseases, Animal pathology, Animal metabolism, Growth rates, Mortality, Toxicity, Nutrient requirements, Iron, Copper, *Tissue analysis.

The requirement of rainbow trout for dietary zinc was investigated by feeding them with diets con-

taining graded levels of zinc. The results of the present study demonstrate that zinc is an essential trace element in the diet of rainbow trout, even though rearing water contains a low concentration of this element (11 microg/l). The fish fed a diet low in zinc content (1ppm) showed an extremely low growth rate and high mortality. A large number of the fish on the zinc-deficient diet were found to suffer from cataracts in the eyes and erosion of the fins and of the skin. The dietary zinc levels also influenced the digestibility of protein and carbohydrate, especially that of protein. The proximate composition of the fish body and the contents of trace elements in the various organs varied according to the dietary zinc levels. Judging from the growth rate of the fish, an adequate zinc content of the diet of rainbow trout was estimated to be 15 to 30 ppm. (EIS-Deal)
W79-03451

ON CHANGES IN THE DENSITY AND SHAPE OF PULP WASTES IN PAPER MILL EFFLUENT AND RIVER WATER OF THE FUJI DISTRICT BEFORE AND AFTER TREATMENT OF THE EFFLUENT (IN JAPANESE),

Takai Univ., Shizuoka (Japan). Faculty of Marine Science and Technology.

T. Mizushima.
Bulletin of the Japanese Society of Scientific Fisheries, Vol. 49, 1978, No. 9, p. 989-997. 4 tab, 6 ref.

Descriptors: *Water pollution effects, *Pulp wastes, Pulp and paper industry, On-site-investigations, Sediments, Industrial wastes, Methodology, Pollutant identification, Pollution abatement, *Particulate matter, *Japan, *Particulate length, *Particle weight.

The Hedoro pollution of Tagonoura Bay by paper mill effluent from the Fuji district is reported to have improved markedly in recent years. In order to determine the mechanism of this improvement, a study was made of the particulate matter pulp wastes present in the effluent within the paper mill of highest production and in the river water of the Fuji district. This report presents the main results of a comparison of the particulate matter before and after treatment of the effluent. (1) It was found that in the river water the water sampling method resulted in collection of a greater proportion of small waste particles, whereas the net sampling method took mainly large waste particles. (2) The comparison with the waste present in the effluent from the mill showed a sharp decrease in weight (to 1/300), number (to 1/44), and mean length (1/3.3), and a marked change in the shape distribution of the particulate matter. (EIS-Katz)
W79-03453

INFLUENCE OF HEAT FROM THE GENTILLY NUCLEAR POWER STATION ON WATER TEMPERATURE AND GASTROPODA,

Quebec Univ., Trois-Rivières.

G. Vaillancourt, and R. Couture.
Canada Water Resources Journal, Vol 3, No 3, p 121-133, 1978. 6 fig, 2 tab, 1 ref.

Descriptors: *Nuclear powerplants, *Thermal pollution, *Mollusks, Mortality, Toxicity, Heated water, Water temperature, Cooling water, Thermal stress, *Aquatic algae, Water pollution effects, Scenedesmus, Gastropods, Growth rates, Animal metabolism, Phytoplankton, Pediastrum, Thermal effluent.

The paper deals with the effects of an increase in water temperature caused by the operation of the Gentilly Nuclear Power Station on the physical characteristics of the environment and on some species of mollusc. The results show an increase in the temperature in the discharge cone of almost 10°C when the reactor is operating at maximum power. In this situation, mortality among the molluscs increases to the point where they disappear completely. An outline of the simulation studies that were made on a few unicellular algae is also presented. (EIS-Deal)
W79-03454

MIGRATORY BIRD MANAGEMENT AND INDUSTRIAL COOLING IN NORTHERN CLIMATES,

Canadian Wildlife Service, Edmonton (Alberta). Western and Northern Region.
R. W. Prach, and D. C. Surrendi.
Canadian Water Resources Journal, Vol 3, No 3, p 11-120, 1978. 3 tab, 9 ref.

Descriptors: *Migratory birds, *Mallard duck, *Thermal pollution, Animal behavior, Ducks(Wild), Canada, Migration patterns, Overwintering sites, Mortality, Thermal powerplants, Heated water, Water temperature, Cooling waters, Environmental effects, Water pollution sources, Wildlife management, *Thermal effluent.

Migratory birds overwintering at Lake Wabasmun, Alberta were investigated. Data are given on numbers and species composition. Overwintering mallards were studied in detail. Open water appears to be the major factor causing mallards to overwinter. Overwintering mallard populations for 1976-77 and 1977-78 were approximately 3,000 and 700 birds respectively. Sex ratios tend to be biased towards males because of the greater tendency for females to migrate and higher mortality for those females remaining. Problems and opportunities available to resource managers as a result of warm water effluent are discussed. (EIS-Deal)
W79-03455

SEEVOGEL ALS INDIKATOREN FÜR ZEITLICH UND ORTLICH BEGRENZTE MEERESVERSCHMUTZUNG IM GEBIET VON HELGOLAND (DEUTSCHE BUCHT) (SEA BIRDS AS INDICATORS OF ACCIDENTAL MARINE POLLUTION IN THE HELGOLAND AREA, GERMAN BIGHT),

Institute fuer Vogelforschung, Helgoland (Germany, F.R.) Inselstation.

G. Vauk.
Veröffentlichungen des Instituts für Meeresforschung in Bremerhaven, Vol 18, p 95-100, 1978. 1 fig, 2 tab, 3 ref.

Descriptors: Oil, *Oil pollution, *Mortality, *Water birds, Toxicity, Oil spills, Gulls, Water pollution effects, Organic compounds, Phosphophosphate pesticides, Pesticide toxicity, Animal pathology, *Parathion, *Kittiwakes, Tissue analysis, Guillemots.

Between January and April 1978, 116 dead or moribund sea birds were collected at Helgoland beaches. 56 birds, mostly guillemots and kittiwakes died from an oil pollution of unknown origin and extension. The majority of 60 unoiied birds, mostly kittiwakes and herring gulls, exhibited symptoms of poisoning. Methyl parathion could be identified in one of the herring gulls. (EIS-Deal)
W79-03457

THE EFFECT OF IN VIVO EXPOSURE OF ENDRIN ON THE ACTIVITIES OF ACID, ALKALINE AND GLUCOSE-6-PHOSPHATASES IN LIVER AND KIDNEY OF OPHIOCEPHALUS (CHANNA) PUNCTATUS,

D.A.V. Coll., Muzaffarnagar (India). Dept. of Zoology.

K. V. Sastry, and S. K. Sharma.
Bulletin of Environmental Contamination and Toxicology, Vol 20, No 4, p 456-460, 1978. 1 tab, 19 ref.

Descriptors: *Enzymes, *Endrin, *Pesticide toxicity, Chlorinated hydrocarbon pesticides, Pesticide kinetics, Fish physiology, Animal metabolism, Biochemistry, *Toxicity, Water pollution effects, Path of pollutants, Proteins, Tissue analysis, Channa, Liver, Kidney.

The effects of in vivo exposure of a sublethal concentration of endrin on the activities of acid, alkaline and glucose-6-phosphatases in the liver and kidney of Ophiocephalus punctatus was studied. The period of exposure was twenty days. In the liver, alkaline phosphatase and glucose-6-phosphatase activities were decreased but acid phosphatase was stimulated. Kidney showed stimula-

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tion in the activity of all the three phosphatases. (EIS-Deal)
W79-03458

A COMPARISON OF THE VARIABILITY OF ASELLUS COMMUNIS (CRUSTACEA: ISOPODA) AND GAMMARUS PSEUDOLIMNAEUS (CRUSTACEA: AMPHIPODA) AND SUITABILITY FOR JOINT BIOASSAYS,
Minnesota Univ., St. Paul. Dept. of Entomology, Fisheries, and Wildlife.
For primary bibliographic entry see Field 5A.
W79-03459

EFFECTS OF SELECTED HEAVY METALS ON EARLY LIFE OF SOCKEYE AND PINK SALMON,
International Pacific Salmon Fisheries Commission, New Westminster (British Columbia).
J. A. Servizi, and D. W. Martens.
Progress Report No. 39, 1978. 26 p, 13 tab, 3 fig, 29 ref.

Descriptors: *Toxicity, *Mortality, Bioassay, Methodology, *Metals, *Cadmium, *Copper, *Mercury, Water pollution effects, Freshwater fish, *Salmon, Sockeye salmon, Pink salmon, Juvenile fish, Fish eggs, Juvenile growth stage, Growth rates, Biological membranes, *Biological concentration, Malformation.

Sockeye and salmon were exposed continuously to cadmium, copper, and mercury under laboratory conditions during the egg to fry stage. Observations of mortality, hatching, development and growth were used to evaluate toxic effects. Mortality, hatching, and growth of sockeye salmon during the egg to fry stage were not affected by continuous exposure to 5.7 microg/l cadmium. However, the 168 hr LC50 for first feeding fry was 8 microg/l cadmium. When exposed to copper, the incipient lethal level was between 37 and 78 for sockeye but between 25 and 55 microg/l for pink salmon during the egg to fry stage. Growth and hatching were no better than mortality as indicators of toxic effects of copper. Copper inhibited egg capsule softening, but associated mortalities during hatching occurred only at concentrations also lethal to eggs and alevins. Copper was concentrated by eggs, alevins and fry in proportion to exposure concentrations. Copper concentrations of 105 and 6.8 ppm in pink salmon eyed eggs and fry, respectively, coincided with mortalities. Continuous exposure of eggs to 2.5 microg/l mercury caused malformed embryos at hatching. Mortality, growth, and hatching were less sensitive to mercury than was malformation. Mercury was concentrated by sockeye and pink salmon in proportion to exposure concentration during the egg to fry stage. Mercury concentrations of 1.87 ppm in eyed eggs coincided with malformed embryos at hatching. (EIS-Katz)
W79-03460

SUBLETHAL EFFECTS OF WEST POINT TREATMENT PLANT EFFLUENT ON COHO SALMON,
Municipality of Metropolitan Seattle, WA.
J. A. Buckley, and C. M. Whitmore.
In: Proceedings of the Northwest Fish Culture Conference, 25th Anniversary, Dec 4-6, 1974, Seattle, p 3-7, 1 tab, 2 fig.

Descriptors: *Toxicity, *Bioassay, Water treatment, *Washington, *Salmon, Laboratory tests, *Sewage, Sewage disposal, Sewage effluents, Sewage treatment, Ammonia, Chlorine, Nitrogen compounds, Fish physiology, Treatment plant outfall, Hemoglobin, Hematology, Sublethal effects, Sublethal stress.

Results indicate no significant stress to test fish exposed to 0.3 percent effluent. However, sublethal stress did occur to fish exposed to 1.1 percent effluent which approximates the concentration of effluent in the immediate area of the treatment plant outfall when poor mixing conditions prevail. Such conditions would be unlikely to occur for more than a very short time and in a small area

adjacent to the diffuser. Of the measures of sublethal stress used in the study, hemoglobin and information from blood smears were the most valuable. (EIS-Katz)
W79-03461

USE OF SODIUM THIOSULFATE DECHLORINATED MUNICIPAL WATER IN SALMON CULTURE,
Weyerhaeuser Co., Springfield, OR.
For primary bibliographic entry see Field 5B.
W79-03462

INTERFACING HYDROTHERMAL AND BIOLOGICAL STUDIES IN WASTE HEAT MANAGEMENT,
MacLaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 5B.
W79-03463

EVIDENCE OF RESISTANCE TO METALS IN LARVAE OF THE MIDGE CHIRONOMUS TENTANS IN A METAL CONTAMINATED LAKE,
Purdue Univ., Lafayette, IN. Dept. of Bionucleonics.

R. Wentzel, A. McIntosh, and G. Atchison.
Bulletin of Environmental Contamination and Toxicology, Vol 20, No 4, p 451-455, 1978. 1 fig, 3 tab, 3 ref.

Descriptors: *Heavy metals, *Diptera, *Mortality, *Midges, Bioassay, Toxicity, Larval growth stage, Animal physiology, Animal metabolism, Adaptation, Resistance, Lakes, Eutrophication, Cadmium, Zinc, Chromium, Chemical wastes, Industrial wastes.

Chironomid larvae were collected from two areas of a lake, one contaminated by heavy metals and one uncontaminated, and subjected to a series of tests to determine if metal resistant strains have developed within the lake. Only 47.5% of the larvae from the unpolluted region survived in highly contaminated sediment used in the 96-hour bioassay. Chironomids obtained from the polluted region of the lake had a survival rate of 75%, suggesting that this population may be somewhat resistant to heavy metal contamination. (EIS-Deal)
W79-03464

LOWERING OF SERUM THYROXINE AND TRIIODOTHYRONINE LEVELS IN YEARLING COHO SALMON, ONCORHYNCHUS KISUTCH, BY DIETARY MIREX AND PCB'S,
Guelph Univ. (Ontario). Dept. of Zoology.

J. F. Leatherland, and R. A. Sonstegard.
Journal of the Fisheries Research Board of Canada, Vol. 35, No. 10, p. 1285-1289, 1978. 3 fig, 14 ref.

Descriptors: *Fish physiology, *Polychlorinated biphenyls, *Sockeye salmon, *Toxicity, Fish diets, Growth rates, Animal metabolism biochemistry, Proteins, Chlorinated hydrocarbon pesticides, Pesticide toxicity, Path of pollutants, Fish behavior, Pesticide residues, *Mirex, Tissue analysis, *Thyroxine, Hormones.

Yearling coho salmon were fed diets contaminated with PCBs or a mixture of Mirex and PCBs daily for 2 or 3 mo. Serum T3 and T4 levels were significantly reduced in fish fed the high Mirex diet for 2 or 3 mo. Serum T3 levels were reduced in fish fed the high PCB diet for 3 mo. Serum T3 and T4 levels were significantly reduced in fish fed the Mirex-PCB diet for 3 mo. The significant increase in serum T3/T4 ratios in fish given the high Mirex or high PCB diet was not evident in fish given the mixed Mirex-PCB diet, suggesting a synergistic effect that is different from the effect of individual contaminants. Fish given the high PCB or high Mirex diet had significantly lower body weights than the control fish. (EIS-Deal)
W79-03465

ENVIRONMENTAL IMPLICATIONS IN THE DESIGN OF COOLING WATER INTAKES,
MacLaren (James F.) Ltd., Willowdale (Ontario).
For primary bibliographic entry see Field 8I.
W79-03466

SIMULATION ANALYSIS OF THE CONCENTRATION PROCESS OF TRACE HEAVY METALS BY AQUATIC ORGANISMS FROM THE VIEWPOINT OF NUTRITION ECOLOGY,
Kyoto Univ. (Japan). Dept. of Sanitary Engineering.
For primary bibliographic entry see Field 5B.
W79-03467

CHROMIC ACID IN ASSIMILATION STUDIES - A CAUTION,
Colorado Univ., Boulder. Dept. of Environmental, Population, and Organismic Biology.
S. H. Bowen.
Transactions of the American Fisheries Society, Vol 107, No 5, p 755-756, 1978. 4 ref.

Descriptors: Fish physiology, *Fish food organisms, Periphyton, Animal metabolism, Chemical properties, Water chemistry, Acids, Biochemistry, Absorption, Digestion, Path of pollutants, *Chromic acid, Tissue analysis, Bioaccumulation, *Sarotherodon.

Chromic oxide is frequently used as a reference compound to measure assimilation of food components by fishes and other animals. Experiments using juvenile Sarotherodon mossambicus indicated that the fish was able to reject chromic oxide when it was added to their diets. It was hypothesized that other fish may possess this ability. This possibility should be considered before the accuracy of the chromic oxide reference techniques are assumed. (EIS-Deal)
W79-03468

EFFECTS OF SEDIMENT ADDITION ON MACROBENTHIC INVERTEBRATES IN A NORTHERN CANADIAN RIVER,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.

D. M. Rosenberg, and A. P. Wiens.
Water Research, Vol 12, p 753-763, 1978. 5 fig, 5 tab, 31 ref.

Descriptors: *Channels, *Sediment load, *Bottom sediments, Sediments, Channel morphology, Benthic fauna, Seasonal, Oligochaetes, Stoneflies, Mayflies, Diptera, Habitats, Canada, Particle size, Suspended solids, Construction, Pipelines, Biological communities, Animal behavior, Insect drift.

Two channels built into the Harris River, Northwest Territories were used to study responses of invertebrates to sediment addition. Sediment was added to one channel continuously for approximately 5 h. The other channel was used as a control. As a result of sediment addition, numbers of macrobenthos drifting from the sediment addition channel increased significantly over those drifting in the control in August and September. Significantly higher numbers of macrobenthos drifted in fall than summer. Numbers of macrobenthos drifting during sediment addition were significantly related to time in fall but not in summer, indicating a seasonal difference in temporal response to sediment addition. (EIA-Deal)
W79-03470

EFFECT OF SEASONAL PHOTOPERIOD ON ACUTE TOXICITY RESPONSES OF JUVENILE RAINBOW TROUT (SALMO GAIRDNERI) TO PULPMILL EFFLUENT,
British Columbia Research Council, Vancouver. Div. of Applied Biology.
D. J. McLeay, and M. R. Gordon.
Journal of the Fisheries Research Board of Canada, Vol 35, p 1388-1392, 1978. 2 fig, 1 tab, 19 ref.

Descriptors: *Rainbow trout, *Photoperiodism, *Pulp wastes, *Toxicity, Juvenile growth stage.

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Seasonal. Pulp and paper industry, Chemical wastes, Bioassay, Heat resistance, Water temperature, Fish physiology, Mortality, Animal metabolism, Carbohydrates.

Acute toxic responses to bleached kraft pulp mill effluent were compared for groups of underyearling rainbow trout reared under constant temperature and either a summer or winter photoperiod. Toxicity tests included a 96-h LC50 bioassay, a 4.5-h sealed-jar test, an 18-h temperature tolerance test, and a 4-h blood-sugar stress bioassay. For all tests the threshold-effect concentration of effluent was not affected by photoperiod. (EIS-Deal) W79-03471

CHRONIC TOXICITY OF WATER-BORNE AND DIETARY LEAD TO RAINBOW TROUT (*SMO GAIRDNERI*) IN LAKE ONTARIO WATER,

Canada Centre for Inland Waters, Burlington (Ontario).

P. V. Hodson, B. R. Blunt, and D. J. Spry. Water Research, Vol. 12, p. 869-878, 1978. 7 fig. 3 tab, 30 ref.

Descriptors: *Lead, *Toxicity, *Rainbow trout, Heavy metals, Iron, Amino acids, Proteins, Biochemistry, Fish physiology, Animal metabolism, Enzymes, Water chemistry, Mortality, Lake Ontario, Fish diets, Path of pollutants, Tissue analysis, Bioaccumulation, Hemoglobin, Mutagens.

Rainbow trout exposed to lead in Lake Ontario water demonstrated a 21-day LC50 of 2.4 mg 1-1 lead. Highest concentrations occurred in opercular bone followed by gill and kidney. Lead accumulation by brain was not clearly demonstrated. Exposure to lead in water at concentrations as low as 13 microg 1-1 caused significant increases in red blood cell (RBC) numbers, decreases in RBC volumes, decreases in RBC cellular iron content and decreases in RBC delta-amino levulinic acid dehydratase activity. No changes were observed in hematocrit or whole blood iron content. The changes indicated increased erythropoiesis to compensate for inhibition of hemoglobin production and increased mortality of mature red blood cells. Lead content of fish exposed to dietary lead was not elevated above control levels and the majority of lead consumed could be accounted for in the feces. Dietary lead may have slightly inhibited uptake of dietary iron. (EIS-Deal) W79-03472

OXYGEN CONSUMPTION OF COHO SALMON IN A PUMPED SALTWATER RACEWAY,

Weyerhaeuser Co., Seattle, WA.

For primary bibliographic entry see Field 81.

W79-03473

EFFECTS OF METHYLMERCURY EXPOSURE ON SEA WATER ADAPTATION OF JUVENILE COHO SALMON AND STEELHEAD TROUT,

Oregon State Univ., Corvallis. Dept. of Fisheries and Wildlife.

B. P. McPherson, and D. R. Buhler.

In: Twenty-third Annual Northwest Fish Culture Conference, Nov 30-Dec 1, 1972, Seattle, Washington, p 43-46. 1 tab, 3 fig, 4 ref.

Descriptors: *Bioassays, Mortality, *Mercury, Metals, *Water pollution effects, *Methylmercury, Rainbow trout, Steelhead trout, *Coho salmon, Salinity, Laboratory tests, Bioassay, Bioaccumulation, Histology, Pathology, Histological observations, Seawater, *Sea water adaptation, Fish migration, Fish physiology.

An attempt was made to test in the laboratory a method that was constructed to evaluate the effects of methylmercury on coho salmon. Histological studies of the tissues of the challenged fish indicated changes that might affect the ability of fish to adapt to marine water. (EIS-Katz) W79-03475

EFECTS OF HOLDING TEMPERATURES ON REPRODUCTIVE DEVELOPMENT IN ADULT SOCKEYE SALMON (*ONCORHYNCHUS NERKA*),

Corvallis Environmental Research Lab., OR. G. R. Bouck, G. A. Chapman, P. W. Schneider, and D. G. Stevens.

In: 26th Annual Northwest Fish Culture Conference, Dec. 3-5, 1975, Otter Rock, Oregon, p 24-40. 9 tab, 3 fig, 6 ref.

Descriptors: *Aquaculture, *Sockeye salmon, *Bioassay, Laboratory tests, Columbia River, *Water temperature, Mortality, *Thermal pollution, Thermal stress, Water pollution effects, Growth, Fish disease, Bacteria, Fish eggs, Fish physiology, Fish reproduction.

Wild adult sockeye salmon (*Onchorhynchus nerka*) were captured and placed into tanks supplied with Columbia River water so that the effects of four temperature treatments could be determined. Treatment included an initial acclimation period wherein temperatures changed about 2°C per day until they reached test temperatures of 10, 16.5, 20 and 22°C on day eight, and remained there until day 32 when cooling to 10°C began. All surviving fish were sacrificed and examined on day 44. The results indicate that 22°C was rapidly and directly lethal to all of the fish and while equally lethal, 20°C resulted in complete mortality more slowly by infection rather than thermal death. Comparisons of fish surviving the 10°C and 16.5°C treatment revealed that 10°C was associated with less frequent ventilation of the gills, smaller livers, larger gonads, less geriatrophy and both a lower incidence and a lower antibody titer against *Columbinaris* disease. The authors conclude that 10°C would be more favorable for sexually maturing adult sockeye salmon than 16.5°C. (EIS-Katz) W79-03476

STUDIES ON NITRITE TOXICITY IN RAINBOW TROUT,

Bureau of Sport Fisheries and Wildlife, Bozeman, MT. Fish Cultural Development Center.

C. E. Smith.

In: 24th Annual Northwest Fish Culture Conference, Dec 5-7, 1973, Wemme, Oregon, p 22-25, 1 tab, 1 fig, 4 ref.

Descriptors: *Toxicity, Mortality, *Nitrogen compounds, *Bioassay, Laboratory tests, Fish hatchery, *Aquaculture, Rainbow trout, Growth, *Nitrates, Methodology.

Bioassays were conducted with rainbow trout to determine the toxicity of nitrites. LC50 concentrations for 12 gram rainbow trout were determined for periods of 48 to 384 hours. 2 gram trout were twice as resistant as 12 gram and larger trout. (EIS-Katz) W79-03477

BASIC ASPECTS OF THE ANTHROPOGENIC TRANSFORMATION OF LAKE ECOSYSTEMS OF THE NORTHWEST OF THE EUROPEAN PART OF THE USSR,

Akademija Nauk SSSR, Leningrad. Inst. of Lake Management.

I. I. Nikolayev.

Hydrobiological Journal, Vol 13 (2), 1977, p 1-7, 40 ref. (translated from Russian).

Descriptors: *Lakes, Ecology, *Piscicides, Fish conservation, *Fish control agents, *Fish harvest, Nutrients, Fertilization, Fertilizers, Reservoirs, Hydroelectric power, *Reservoir fisheries, Reservoir operators, Reservoir stages, Water level, Irrigation requirements, Thermal effluents, Thermal effects, Aquatic plants.

Literature data and investigative results are used to analyze the main consequences of anthropogenic action on lake ecosystems. Examples are given of the complete reconstruction of the ecosystems of small lakes by using ichthyicides and subsequent stocking of the water bodies with the valuable ichthyofauna of ponds and the introduction of fertilizers. In the case of large lakes, the consequences

of converting them into powerplant reservoirs and the variations in level connected with this are analyzed. In the case of medium-sized lakes, the effects of reducing the water level by using the water for irrigation are determined. The effects of the warm power-plant effluents on aquatic organisms are described. Examples of transplantation of ichthyofauna, invertebrates, and aquatic plants are given, and role of random factors is described. (EIS-Katz) W79-03478

SOME PATTERNS OF CHANGE IN LACUSTRIINE ECOSYSTEMS UNDER ANTHROPOGENIC INFLUENCE,

Polish Academy of Sciences, Warsaw. Inst. of Ecology.

Z. Kajak.

Hydrobiological Journal, Vol. 13 (2), 1977, p. 8-16. 6 tab, 4 fig, 22 ref. (translated from Russian).

Descriptors: *Eutrophication, Nutrients, Water pollution effects, *Zooplankton, *Benthos, Polychaetes, Tubificid worms, *Water temperature, Freshwater fish, Carnivores, Phytoplankton, Biomass, *Mazurian lakes, Poland, Fertilizers, Primary production, Carp, Hypophthalmichthys.

Very rapid eutrophication of the Mazurian lakes has been noted. Under the influence of the influx of biogenic substances, a dystrophic lake was turned into a eutrophic one, while signs of degradation made their appearance in the polytrophic lake. Data were obtained on the feeding of the dominant plankton and benthos species (*Dreissena*, tubificid worms) and their role in the ecosystem. The production and production efficiency at the individual trophic levels were determined in different lakes, and the energy flow in the lake ecosystem was assessed. It was proved that warming the water improved its self-purification in four of the lakes studied, but was detrimental in the polluted river. Transplantation of *Hypophthalmichthys molitrix* into a lake produced a drastic decrease in the plankton, completely changed the biocoenosis and the purification function of the lakes. (EIS-Katz) W79-03479

THE OXIDATION OF PETROLEUM HYDROCARBONS BY MARINE BACTERIA,

State Oceanographic Inst., Moscow (USSR).

A. B. Tayban, A. N. Zubakina, S. P. Barinova, and I. M. Mikhaleva.

Descriptors: Oil, *Oil pollution, *Bacteria, Oil spills, *Decomposing organic matter, *Oxidation, Petroleum hydrocarbons, *Marine bacteria, Alkanes, *Daily degradation rates, Arctic bacteria, Caspian Seas, Microbial degradation rates, Diesel oil.

The results of experiments designed to estimate the rate of the microbial oxidation of oil and hydrocarbons and to study the specific response of test cultures to individual n-alkanes are presented. It was proved that the degree of oxidation of oil and hydrocarbons by the individual cultures of marine bacteria and a mixed bacterial population isolated from the Caspian Sea and from the river Lena ranges from 20 to 98%; the n-alkanes were utilized most intensively. The daily degradation rate of hydrocarbons ranged from 20 to 470 mg/liter (at 20 to 25°C). Arctic cultures assimilated the n-alkanes C16-C24 most actively, while the Caspian ones showed a preference for the lighter (C10, C12 and C14) hydrocarbons. (EIS-Katz) W79-03480

TOXICITY OF CARBOFURAN TO BLUE-GREEN ALGA NOSTOX MUSCORUM,

Central Rice Research Inst., Cuttack (India). Lab. of Blue-Green Algae.

S. Kar, and P. K. Singh. Bulletin of Environmental Contamination and Toxicology, Vol 20, p 707-714, 1978. 2 fig, 2 tab, 13 ref.

Descriptors: *Cyanophyta, *Pesticide toxicity, *Biodegradation, *Toxicity, Pesticides, Growth

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5C—Effects Of Pollution

rates, Nitrogen fixation, Metabolism, Photosynthesis, Chlorophyll, Tolerance, Optical properties, Cytological studies, *Furadan, *Carbofuran, *Nostoc.

The effects of commercial grade pesticide furadan (3% a.i. as carbofuran) on the survival, growth and nitrogen fixation of blue-green algae was studied. The lower concentration of furadan (25 microg/ml) enhanced survival, growth and nitrogen fixation in the alga whereas these were gradually inhibited in higher concentrations (50-1000 microg/ml). The presence of more than 1200 microg/ml was acicidal. Preliminary observations revealed that the pesticide is biodegraded by the alga. (EIS-Deal)
W79-03482

BIOCONCENTRATION RATIO OF DIAZINON BY FRESHWATER FISH AND SNAIL,
National Inst. of Agricultural Sciences, Tokyo (Japan).

J. Kanazawa.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 613-617, 1978. 1 fig, 2 tab, 4 ref.

Descriptors: *Diazinon, *Pesticide kinetics, *Pesticide residues, Path of pollutants, Organophosphorus pesticides, Carp, Crayfish, Snails, Fish physiology, Animal physiology, Animal metabolism, Enzymes, Bioconcentration, Tissue analysis, *Grudgeon, Guppy, Diazinon.

The bioconcentration ratios of diazinon from water by freshwater fishes were generally larger than that of crayfish and snails. Among fishes, the bioconcentration ratio of diazinon by topmouth grudgeon was the highest. However, elimination of diazinon from fish was linearly rapid. The influence of test concentration on the bioconcentration ratio was not considerable. The bioconcentration ratio of diazinon in whole body of topmouth grudgeon increased proportional to the body weight. (EIS-Deal)
W79-03483

PCB RESIDUES IN MULLET, MUGIL CEPHALUS, FED TO CAPTIVE EASTERN AUSTRALIAN WATER RATS, HYDROMYS CHRYSOGASTER,

Commonwealth Scientific and Industrial Research Organization Lyneham (Australia). Div. of Wildlife Research.

For primary bibliographic entry see Field 5B.

W79-03484

ARSENIC CONCENTRATION IN CANNED TUNA FISH AND SARDINE,

Tehran Univ. (Iran). Dept. of Toxicology.

For primary bibliographic entry see Field 5A.

W79-03485

CADMIUM-INDUCED PHAGOCYTE CYTOTOXICITY,

Albany Medical Coll., NY. Inst. of Comparative and Human Toxicology.

L. D. Loose, J. B. Silkworth, and D. Warrington. Bulletin of Environmental Contamination and Toxicology, Vol 20, p 582-588, 1978. 2 tab, 18 ref.

Descriptors: *Cadmium, *Cytological studies, *Toxicity, Chemical analysis, Animal physiology, Biochemistry, Chlorides, Metals, Ions, Water pollution effects, *Tissue analysis, *Acetates, *Phagocytes, *Macrophages, *Neutrophils.

At equal concentrations cadmium acetate was significantly more cytotoxic than cadmium chloride to mouse peritoneal macrophages. The converse was observed with polymorphonucleated neutrophils. No preferential cytotoxicity to pulmonary alveolar macrophages was manifested either by cadmium acetate or cadmium chloride. (EIS-Deal)
W79-03486

MERCURY DETERMINATION IN A RIVER OF MOUNT AMIATA,
Siena Univ. (Italy). Chair of Hydrobiology and Fish-Culture.

For primary bibliographic entry see Field 5A.
W79-03487

MERCURY BURDEN IN CRAYFISH FROM THE WISCONSIN RIVER,
Wisconsin Dept. of Natural Resources, Madison. Bureau of Water Quality.

For primary bibliographic entry see Field 5A.
W79-03488

RESPIRATION, GROWTH AND FOOD CONVERSION EFFICIENCY OF PINFISH (LAGODON RHOMBOIDES) EXPOSED TO SUBLETHAL CONCENTRATIONS OF BLEACHED KRAFT MILL EFFLUENT,
Florida State Univ., Tallahassee. Dept. of Biological Science.

A. W. Stoner, and R. J. Livingston.
Environmental Pollution, Vol 17, p 207-217, 1978. 2 tab, 33 ref.

Descriptors: *Pulp wastes, *Toxicity, Fish physiology, *Respiration, *Growth rates, Animal metabolism, Biochemistry, Lipids, Proteins, Digestion, Effluents, Animal pathology, Fish diseases, Fish behavior, Pulp and paper industry, *Pinfish, Lagodon, Tissue analysis.

Young pinfish were exposed to 0.01%, 0.10% and 1.00% concentrations of neutralized bleached kraft mill effluent (BKME) for 28 days. Fish exposed to 1.00% BKME demonstrated elevated gill ventilation rates and were characterized by reduced total lipid content, reduced condition factor, increased moisture, and increased protein content when compared with controls. Control fish converted 44.6% of the ration to wet weight. Wet food conversions of pinfish exposed to 0.10% and 1.00% BKME were reduced by 47.8% and 73.5%. No respiratory, biochemical or food conversion differences were found between controls and fish exposed to 0.01% BKME. Differences were significant in concentrations of BKME less than 1.0% of the lethal concentration. (EIS-Deal)
W79-03490

SOME FEATURES OF ION EXCHANGE IN FISH DURING THEIR ADAPTATION TO A HIGHER CO₂ CONTEST IN THE WATER,
Akademiya Nauk USSR, Kiev. Inst. Hidrobiologii.

V. D. Romanenko, and V. A. Krisal'nyy.
Hydrobiological Journal, Vol 13(2), 1977, p 73-76, 2 fig, 8 ref. (translated from Russian).

Descriptors: *Freshwater fish, *Fish physiology, Biochemistry, *Carbon dioxide, Ion exchange, Ion transport, Fish diseases, Acidity, Oxygen, Bicarbonate, Water quality, *Carp, Bicarbonate buffer system, Water pollution effects.

It was shown in chronic tests on carp that exposure in water with high (0.4, 0.8 and 1.1 mM/liter) content of free carbon dioxide produces changes in the bicarbonate buffer system of the blood, as well as sharp shifts in ion exchange. The content of bicarbonates, sodium and potassium in blood plasma increased so as to prevent carbon dioxide academia. In the complicated process of regulating homeostasis in fishes, an important place belongs to the redistribution of ions between the tissues and blood plasmas. (EIS-Katz)
W79-03492

THE SURVIVAL OF THE YOUNG OF THE GREY MULLET MUGIL SALIENS RISSO IN THE PRESENCE OF PHENOL,
Odessa State Univ. (USSR).

F. S. Zambraborsch, and B. Lay.
Hydrobiological Journal, Vol 13 (2), 1977, p 82-84. 3 tab, 10 ref. (translated from Russian).

Descriptors: *Toxicity, Marine fish, *Biassay, *Phenols, Juvenile fish, Juvenile growth stages,

Survival rates, *Lethal concentrations, Water temperature, Water pollution effects, Laboratory tests, Methodology, *Mugil saliens, Mullet.

In investigations of the survival rate of the fry of Mugil saliens Risso at phenol concentrations of 5 to 30 mg/liter, an inverse correlation was established between these factors. The average lethal concentration of phenol (LC50) at an exposure of 24 hours was 21.5 mg/liter, at a 48 hour exposure it was 16.6 mg/liter and with 72 hours, 15.5 mg/liter. The life of the fish in the presence of phenol decreased with a decrease in water temperature. (EIS-Katz)
W79-03493

THE EFFECTS OF SODIUM LAURYL SULFATE ON THE STEROL FRACTION OF MYA ARENARIA,

Institute of Biology of the Southern Seas, Odessa (USSR).

R. P. Kandyuk, and V. I. Palamarchuk.
Hydrobiological Journal, Vol 13 (2), 1977, p 84-87. 1 tab, 2 fig, 10 ref. (translated from Russian).

Descriptors: Water pollution effects, *Detergents, *Molluscs, Clams, Biochemistry, Animal metabolism, Animal physiology, Sterols, *Toxicity, Chromatography, Water pollution effects, Commercial shellfish, *Anionic detergents, *Sodium lauryl sulfate, *Mya arenaria, Black Sea.

The anionic detergent sodium lauryl sulfate disrupts the metabolic processes in the new Black Sea arrival of *M. arenaria*, in particular changing the content of total and individual sterols. An 0.01% dose of the detergent at an exposure of three days proved highly toxic to the mollusks which was reflected in the death of some individuals. (EIS-Katz)
W79-03494

ACCLIMATION TEMPERATURE AND TEMPERATURE TOLERANCE IN FINGERLING LARGEMOUTH BASS (MICROPTERUS SALMOIDES),

North Texas State Univ., Denton. Dept. of Biological Sciences.

For primary bibliographic entry see Field 5G.
W79-03495

SOME ASPECTS OF THE BIOLOGY AND HEAVY METAL ACCUMULATION OF THE FISH LIPARIS LIPARIS IN THE SEVERN ESTUARY,
Bath Univ. (England). School of Biological Sciences.

K. S. Badsha, and M. Sainsbury.
Estuarine and Coastal Marine Science, Vol 7, p 381-391, 1978. 6 fig, 6 tab, 5 ref.

Descriptors: *Growth rates, *Heavy metals, *Fecundity, Lead, Zinc, Cadmium, Food habits, Fish behavior, Fish physiology, Animal metabolism, Path of pollutants, Fish populations, Seasonal, Fish migration, Fish reproduction, *Liparis, Tissue analysis, Bioaccumulation.

The feeding habits, rates of growth, fecundity and other aspects of the general biology of *Liparis liparis* from the Severn estuary are reviewed for the period 1973-1976. Additionally the levels of heavy metals present in the tissues of *L. liparis* have been determined and compared with those found in related teleost species. (EIA-Deal)
W79-03497

REDUCED TOXICITY OF AN AQUEOUS COAL-CONVERSION EFFLUENT FOLLOWING WASTE DISPOSAL TREATMENT,
Tennessee Univ., Oak Ridge. Graduate School of Biomedical Science.

T. W. Schultz, S. T. Perry, and J. N. Dumont.
Bulletin of Environmental Contamination and Toxicology, Vol 20, p 633-639, 1978. 2 fig, 1 tab, 15 ref.

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

Descriptors: *Protozoa, *Waste water treatment, *Toxicity, *Filtration, Growth rates, Animal behavior, Animal populations, Oxygen demand, *Coals, *Fossil fuels, Effluents, Bioassay, Animal metabolism, Respiration, Chemical wastes, Industrial wastes, Phenols, Coal-conversion effluent, *Tetrahymena, *Coal conversion.

The purpose of this report is to examine the biological effects of the liquid effluent stream from the 'oxycontact' bioreactor unit on a model system—the ciliate *Tetrahymena pyriformis*. As concentrations increased above 20%, dose-dependent relationships were noted in behavioral modifications (e.g. - loss of motility) and oxygen uptake (reduced). The population growth rate was not altered by the concentrations tested. It was concluded that the treatment of coal-conversion effluents was successful in reducing the toxicity of the effluent. (EIA-Deal)
W79-03498

TOXICOLOGICAL COMPARISON OF NATURAL AND CULTURED POPULATIONS OF *ACARTIA TONSA* TO CADMIUM, COPPER AND MERCURY.

Environmental Research Lab., Narragansett, RI. S. L. Sosnowski, and J. H. Gentile. Journal of the Fisheries Research Board of Canada, Vol 35, p 1366-1369, 1978. 3 tab, 13 ref.

Descriptors: *Cadmium, *Copper, *Mercury, *Toxicity, *Copepods, Metals, Heavy metals, Genetics, Biological communities, Aquatic populations, Mortality, Bioassay, Nutrient requirements, Salinity.

Cultured *Acartia tonsa* manifested a reproducible toxicological response through six generations. There were no statistically significant differences in the responses of F1 and F6 generations to cadmium, copper, and mercury. Cultured and field populations (parental) exposed to cadmium did not manifest statistically different response patterns. The response variability of cultured populations was less than that of field populations. (EIS-Deal)
W79-03499

EFFECTS OF ENVIRONMENTAL CALCIUM CONTENT ON PLASMA CALCIUM LEVELS IN GOLDFISH.

Nagoya Univ. (Japan). Fisheries Lab. S. Umehara, and M. Oguri. Bulletin of the Japanese Society of Scientific Fisheries, Vol 44, No 8, p 827-833, 1978. 5 fig, 2 tab, 20 ref.

Descriptors: *Calcium, *Fish physiology, Animal metabolism, Sea water, Enzyme, Freshwater, Toxicity, Cytological studies, Chemical analysis, Water chemistry, Hydrogen ion concentration, Sodium, Potassium, *Goldfish, Carassius, Tissue analysis, *Histology.

The authors investigated the effects of Ca²⁺ in environmental water on goldfish plasma Ca²⁺ levels. Plasma Ca²⁺ levels increased markedly in goldfish transferred to 1/3 diluted sea water. However, the levels did not change in the goldfish transferred to Ca²⁺-rich fresh-water. Furthermore, in the goldfish transferred to 1/3 sea water, the histological structures of the corpuscle of Stannius, water movement rate in the intestine and Ca²⁺-activated ATPase activity in gill changed significantly. On the contrary, these changes were not observed in goldfish transferred to Ca²⁺-rich fresh-water. (EIS-Deal)
W79-03500

5D. Waste Treatment Processes

EVALUATION AND COMPARISON OF OVERLAND FLOW AND SLOW RATE SYSTEMS TO UPGRADE SECONDARY WASTEWATER LAGOON EFFLUENT.

Utah State Univ., Logan. Coll. of Engineering. M. C. Kemp, D. S. Filip, and D. B. George. Available from the National Technical Information

Service, Springfield, VA 22161 as PB-291 726, Price codes: A04 in paper copy, A01 in microfiche. Utah Water Research Laboratory, Logan Water Quality Series UWRL/Q-78/02, December 1978. 60 p, 38 fig, 42 tab, 2 append. OWRT A-034-UTAH(1). 14-34-0001-8047.

Descriptors: *Sewage treatment, *Overland flow, Irrigation, Lagoons, Oxidation lagoons, Waste water treatment, Waste disposal, *Slow rate systems, Tertiary treatment.

To evaluate the effectiveness of overland flow treatment in upgrading secondary wastewater lagoon effluent, three 15 x 36 m plots on a 2.5 percent slope were constructed and sown for a high density vegetative cover using Reed Canary grass. Wastewater was applied to the upper end of each plot at rates of 7.5, 15, and 22.5 cm/week. Results from the overland flow system investigation were compared with similar data obtained the preceding year from an existing slow rate land application system on an adjacent site. Secondary effluent from the same lagoon system was applied to the slow rate system study area. After evaluating influent and effluent water quality characteristics from both systems, site specific efficiencies were detailed. Overland flow as a tertiary treatment process may not be suitable to satisfy future discharge standards because of the minimum biochemical oxygen demand and suspended solids effluent concentrations that are attainable. Overland flow could be used as a nitrification-denitrification process if land costs were sufficiently low. The slow rate system can be an excellent tertiary treatment method if the groundwater is protected and no subsurface water collection and discharge is required. If a discharge is required, organic carbon and nutrient concentrations might be unacceptable depending upon initial site soil conditions.
W79-03007

FEDERAL GUIDELINES, STATE AND LOCAL PRETREATMENT PROGRAMS, VOLUME III, APPENDIX 8.

Environmental Protection Agency, Washington, DC. Municipal Construction Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 783, Price codes: A18 in paper copy, A01 in microfiche. Report No. EPA-430/9-76-017c, January 1977. 409 p, 87 fig, 80 tab, 63 ref.

Descriptors: *Pre-treatment(Water), Waste water, *Industrial wastes, *Waste water treatment, Neutralization, Sedimentation, Filtration, Effluents, Liquid wastes, Treatment facilities, Publications, Pollutants, Adsorption, Activated carbon, Separation techniques, Treatment facilities, Public utilities, Sewerage.

Data concerning the major industries potentially contributing waste water to publicly owned sewer systems and treatment works are presented. Thirty-four major industrial categories, partially established by the Federal Water Pollution Control Act Amendments of 1972 (PL 92-500), are summarized according to the: (1) a general industry description of the products, raw materials, and waste characteristics; (2) the categorization and subcategorization developed by the EPA in the effluent guidelines program; (3) process descriptions; (4) waste characterization; and (5) control and treatment technology with in-plant controls and end-of-pipe treatment used. Pretreatment is generally required by EPA, states, and municipalities to prevent pollutants from being discharged through municipal systems. Pretreatment considerations involve assessment of individual plant effluents, in-plant control methods, recycle opportunities, water conservation and reuse possibilities. Such considerations may differ depending on whether or not the pollutants to be controlled are susceptible to treatment in a Publicly Owned Treatment Works (POTWS). Pretreatment for compatible and incompatible pollutants may take a variety of forms including coarse solids separation, grit removal, equalization, neutralization, dissolved air flotation, sedimentation, filtration, biological treatment, physical-chemical treatment, chemical pre-

cipitation and coagulation, activated carbon adsorption, and chemical conversion. (Davison-IPA) W79-03009

A STUDY OF WASTE GENERATION, TREATMENT AND DISPOSAL IN THE METALS MINING INDUSTRY.

Midwest Research Inst., Kansas City, MO. D. Bendersky, R. E. Gustafson, C. E. Mumma, K. R. Walker, and D. Costello.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 052, Price codes: A18 in paper copy, A01 in microfiche. Final Report No. SW-132c, October 1976. 406 p, 37 fig, 120 tab, 308 ref, 4 append.

Descriptors: *Waste disposal, *Mine wastes, *Metals, *Waste treatment, *Landfills, Tailings, Overburden, Waste rock, Copper, Lead, Zinc, Chromium, Cadmium, Antimony, Mercury, Uranium, Vanadium, Selenium, Asbestos, Arsenic, Beryllium, Waste identification, Cost analysis, Hazards.

The purpose of this study was to provide the Environmental Protection Agency with a data base regarding the current and projected types and quantities of the potentially hazardous wastes generated by the metals mining and concentrating industry, applicable treatment, and disposal technologies and their costs. According to the contract, specific attention was to be given to wastes containing asbestos, arsenic, lead, mercury, halogenated hydrocarbons, pesticides, selenium, and zinc. Other potential hazards included were carcinogens, chromium, and cadmium. The industry generated a total of 2,365 million tons of waste during 1974 consisting of waste rock, overburden, dry concentration wastes, and wet wastes. The largest amount of these wastes was produced by the copper industry with uranium-vanadium, lead-zinc, mercury, and miscellaneous ores following in that order. Overburden and waste rock, except for uranium ore waste rock, do not add to the potential hazards of the disposal site they occupy because their hazardous content is about the same as the site. Concentration process wastes, fine grained and subject to wind and water erosion, may contain potentially hazardous concentrations higher than their disposal site. Potentially hazardous substances have been identified in the land disposed wastes of the following: copper ore tailings, lead-zinc tailings, uranium ore waste rock, uranium ore tailings, antimony ore tailings, and beryllium ore tailings. Adequate waste treatment and land disposal methods are available to companies mining and concentrating copper, lead-zinc, zinc, mercury, and miscellaneous metals ores. Costs of waste disposal vary depending on the type of ore, mining method, and quantity of waste. (Davison-IPA)
W79-03010

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM, AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION.

Environmental Protection Agency, Washington, DC. Municipal Construction Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-266 695, Price codes: A04 in paper copy, A01 in microfiche. Report Nos. EPA-430/9-76-009, and MCD-30, April 1976. 67 p, 1 fig, 22 tab, 7 append.

Descriptors: *Waste treatment, *Sewage sludge, *Treatment facilities, Sludge disposal, *Municipal wastes, Ocean disposal, Incineration, Landfills, Lagoons, Cities, Communities, Regional analysis, Capital costs, Maintenance costs, Operating costs, Environmental effects, Water Pollution Control Act, Sewage lagoons, Sewage disposal, Sewage ponds, Cost analysis.

A summary of information available on municipal sewer sludge production and alternatives for the disposal/utilization of municipal sewer sludge is presented. The major cities are the key problem areas of sludge disposal. Many are phasing out current ocean disposal, and have problems obtaining sites and approval of sludge management alter-

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

natives. Of the 22,000 municipal treatment plants, over 5,000 are waste water treatment ponds having few disposal problems. Fewer than 350 of the remaining 17,000 plants are larger than 10 MGD; 65% of the nation's plants are estimated at less than 1 MGD in design flow. Current methods of municipal sewage sludge disposal are estimated as follows: ocean disposal, 15%; incineration, 35%; landfill, 25%; and land applications, 25%. Not included in these estimates are the operations storing sludge in lagoons with no future disposal method planned. Sludge disposal practices vary within the states as well as within the regions, i.e., communities in the Midwest apply sludge to the land, the major inland cities use landfills and incineration, and only areas near the ocean utilize ocean disposal. Capital costs and operation and management costs, dependent upon such variables as energy, transportation, land, labor, monitoring requirements, and environmental regulations, vary greatly for the several sludge management alternatives. It is estimated that 30 to 50% of a conventional treatment plant's capital costs go for sludge management treatment and that more than \$400 million/year are required for operation and management costs. (Davison-IPA)

W79-03011

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION, FORMULATION OF ALDRIN/DIELDRIN, DDT, ENDRIN, TOXAPHENE,

Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 017. Price codes: A07 in paper copy, A01 in microfiche. Report No. EPA-440/9-76-015 and MRI-41227-C. June 1976. 124 p, 12 fig, 4 tab, 33 ref, 3 append. 68-01-3524.

Descriptors: *Industrial wastes, *Pesticides, *Waste water treatment, Technology, Aldrin, Dieldrin, Endrin, Toxaphene, Water use, Evaporation, Sewers, Landfills, Activated carbon, Adsorption, Incineration, Rain water, Economics, Capital cost, Operating costs, Models, Toxicity, Water pollution sources, Surface runoff, Cost comparison, Cost analysis, Water conservation, Waste water disposal.

Waste water management and associated costs at plants manufacturing aldrin/dieldrin, DDT, endrin, and toxaphene are examined. The entire pesticide formulation industry is characterized with regard to its waste water treatment technology, waste water management costs, the usage of water, and the source of waste water in these plants. Inplant control technology for eliminating the use of water and minimizing contamination of waste water discussed. Current and former practices such as evaporation systems, sewer systems, landfills, contract disposal, activated carbon adsorption, incineration are described. Methods for managing process waste water intended to achieve zero discharge of the cited pesticides include: elimination of process water, evaporation systems and contract disposal. Methods for managing rainwater runoff directed at achieving zero discharge include covering all formulation operations, removing or paving over contaminated soils, and diversion of 'clean' runoff. Estimates of capital investment and annual operating costs are made on the basis of model plants developed using the technology aimed at zero discharge of the designated pollutants. (Davison-IPA)

W79-03015

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR ENDRIN MANUFACTURE,

Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 015, Price codes: A06 in paper copy, A01 in microfiche. Final Report No. EPA-440/9-76-011, February 6, 1976. 100 p, 5 fig, 7 tab, 39 ref, 1 append. 4127-C.

68-01-3524.

Descriptors: *Waste water treatment, *Endrin, *Organic pesticides, *Halogenated pesticides, *Industrial wastes, Activated carbon, Sedimentation, Filtration, Neutralization, Adsorption, Resins, Degradation, Capital costs, Direct costs, Indirect costs, Pilot plants, Velsicol Chemical Corporation, Cost analysis, Cost comparisons.

The treatment of waste water resulting from the production of endrin, a stereo-isomer of dieldrin, by the Velsicol Chemical Corporation, the sole U.S. manufacturer of endrin, is examined. Plant capacity and production rate data were not available, but production for 1975 was estimated at 6 million pounds of endrin. Total waste water discharge from the plant averaged 3,514 gpm and contained an average of 2.5 lb of endrin/day in May 1975. Both process waste waters and cooling waters are contaminated with endrin. The current (1975) waste water treatment system consists of sedimentation, sand filtration, fine cartridge filtration, and neutralization. After treatment, the waste waters are discharged into the municipal sewer system. Four waste water treatment systems potentially effective in reducing the concentration of endrin and the daily load are examined in detail. The four systems are: resin adsorption, reductive degradation, resin adsorption and reductive degradation in series, and activated carbon adsorption. These systems are feasible according to laboratory experiments, and the first three are under laboratory pilot plant study at the site. The technology for the activated carbon system is available in other industries and is most likely transferable to endrin use. Waste water treatment cost estimates for these systems include capital investment costs, direct costs, and indirect costs. (Davison-IPA)

W79-03017

WASTEWATER TREATMENT IN COLD CLIMATES,

Army Terrestrial Sciences Center, Hanover, NH.
R. S. Sletten, and A. Uiga.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-026 156. Price codes: A02 in paper copy, A01 in microfiche. 1976. 15 p, 5 fig, 6 tab, 15 ref.

Descriptors: *Waste water treatment, *Alaska, *Treatment facilities, Aerated lagoons, Aeration, Arctic, Federal Water Pollution Control Act, Military reservations, Filtration, Ponding, Land management, Personnel, Weather.

Waste water treatment systems in use at remote military installations in Alaska are described, and techniques for upgrading these systems to meet EPA's secondary effluent criteria are discussed. Existing systems primarily use aerated lagoons and extended aeration package plants, and indications are that most of these systems could not meet EPA's secondary effluent criteria. Due to the remote, isolated nature of most of the camps, it is suggested that upgrading processes be as simple as possible to design, build and operate. Potentially feasible techniques include land application, intermittent filtration, and variations of ponding, although no one solution can be recommended for every situation because of the limiting factors of land availability for ponding and availability of suitable soils for land application or intermittent filters. To ensure effective waste water treatment in the Arctic, long range requirements include the availability of trained treatment plant operators and research into methods to make arctic weather as asset rather than a liability. (Gibson-IPA)

W79-03020

THE EFFECTS OF UV LIGHT ON TNT AND OTHER EXPLOSIVES IN AQUEOUS SOLUTION,

Naval Weapons Support Center, Crane, IN. Weapons Quality Engineering Center.

C. C. Andrews, and J. L. Osmom.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 132, Price codes: A04 in paper copy, A01 in microfiche. Report No WQEC/C-77-32, January 12, 1977. 65

p, 8 fig, 12 tab, 7 ref, 3 append.

Descriptors: *Waste water treatment, *Explosives, *Ultraviolet radiation, *Peroxide, Acetone, Organic compounds, Chemical wastes, Effluents, Pollution abatement, Water pollution sources, Nitrogen compounds, Laboratory tests, Cyanide, Ammonia.

Four bench-scale ultraviolet (UV) light systems used in treating water contaminated with explosive compounds were studied. The use of acetone and hydrogen peroxide with the UV light are reviewed. Small concentrations (0.1%) of hydrogen peroxide used with UV light yielded the best treatment for removing TNT, Explosive D, cyclotene (RDX), homocyclonite (HMX), 2, 4 DNT (dinitrotoluene), and 2, 6 DNT from contaminated solutions. Each compound was eliminated within an hour or less of hydrogen peroxide exposure, a decrease of their TOC load was observed. Only negligible amounts, 10 to 50 ppb, of trinitrobenzene were present after one hour of exposure, and it appeared that the organic material was destroyed. The use of acetone in the UV continuous flow system prototyped the UV-peroxide system, but its success was questionable because of its volatility and flammability, and because it contributed undesirable qualities to the solution through TOC concentration. It was established that the static system was more efficient than the continuous flow system, but the flow rate must be regulated to allow sufficient constant exposure for best results. During the study peroxide was introduced to the explosive solution just before treatment. During the study peroxide was introduced to the explosive solution just before treatment. However, the addition of small increments on a continuous basis may result in greater efficiency with less peroxide waste. (Davison-IPA)

W79-03026

OXONIZATION OF WATER CONTAINING HUMIC COMPOUNDS, PHENOLS, AND PESTICIDES (OZONIROVANIYE VODY, SODERZHASHCHEY GUMINOVYE SOYEDINENIYA, FENOLY I PESTITSIDY),

R. D. Gabovich, and I. L. Kurennoy.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 406, Price codes: A02 in paper copy, A01 in microfiche. Voprosy Konomonalnoy Gigiyeny, No 6, p 11-19, 1966. Translated by Army Medical Intelligence and Information Agency, Washington, D.C. Translation No USAMIA-K-4564.

Descriptors: *Ozone, *Water purification, *Chlorination, *Pesticides, *Color reactions, Water analysis, Phenols, Water quality, Sewage treatment, Organic matter, Decomposing organic matter, Humic acids, Degradation, Water pollution treatment, Waste water treatment, Water quality, Odor.

Conditions affecting the use of ozone to break down mixtures of humic substances and decolorize water, and the use of ozone for breaking down phenols and some pesticides in distilled water solutions and humic solutions were studied. The addition of ozone to water breaks down humic substances and the color they impart to the water. The amount of ozone required to decolorize the water varied depending on the degree of water chromaticity. The amount of ozone required to dephenolize water was from 0.75 to 2.5 milligrams of ozone per milligram of phenol depending on the degree of purification. The effects of ozone on the pesticides, malathion, methylparathion, wofatos, trichlorometaphos, preparation M-81, and dintrortho cresol, in distilled water with color added, were studied. It was found that in the deodorization of water containing only toxic chemicals, ozone worked best in some cases, and chlorine worked best in others. Humic compounds in natural waters did not prevent deodorization, but might require more ozone because decolorization occurs at the same time as pesticide breakdown. It is concluded that ozonation and chlorination can be used to disinfect sewage containing large amounts of pesticides. (Davison-IPA)

W79-03027

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

PROCEEDINGS OF THE FIFTH NATIONAL SYMPOSIUM ON FOOD PROCESSING WASTES.

Pacific Northwest Environmental Research Lab., Corvallis, OR. Industrial Wastes Branch.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-237 520. Price codes: A15 in paper copy, A01 in microfiche. Report No EPA-660/2-74-058, June 1974. 326 p., 64 fig., 105 tab., 118 ref. Symposium held in Monterey, California, April 17-19, 1974.

Descriptors: *Food processing industry, *Conferences, *Industrial wastes, *Waste water treatment, *Waste treatment, Anaerobic digestion, Liquid wastes, Water pollution sources, Solid wastes, Sludge disposal, Effluents, Activated sludge, Biodegradation, Byproducts, Organic wastes, Costs, Economic impact, Land management, Biological treatment, Water reuse.

A compilation of 18 papers on food processing wastes is presented. Topics covered include: land treatment of food processing waste water, municipal waste water service charges, use of rotating biological contactor on meat industry waste waters, waste water reuse, use of ligosulfonic acid for removal of protein and fat from meat slaughtering and packing wastes, treatment of rum distillery slops, shrimp plant waste water, use of wastes as animal feed stock, fishery byproduct utilization, pretreatment of vegetable oil refinery wastes, economic effects of treating fruit and vegetable processing liquid wastes, and waste water characterization for the specialty food industry. (Davison-IPA)

W79-03031

COMPOSTING AT JOHNSON CITY: JOINT USEPA-TVA COMPOSTING PROJECT WITH OPERATIONAL DATA, 1967-1971. VOLUMES I AND II.

Environmental Protection Agency, Washington, DC. Office of Solid Waste.

For primary bibliographic entry see Field 5E.

W79-03032

A RECYCLED-WATER SANITARY WASTE DISPOSAL SYSTEM.

West Virginia Univ., Morgantown.

W. J. Shoupp.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 740. Price codes: A07 in paper copy, A01 in microfiche. PhD Dissertation, 1978. 117 p., 18 fig., 9 tab., 106 ref., append. OWRT A-034-WVA(1). 14-34-0001-7104.

Descriptors: *Aerobic treatment, *Domestic wastes, *Microbial degradation, *Microbiology, *Microorganisms, *Recycling, *Sewage treatment, *Water waste treatment, *Water conservation, *Water reuse, Bacteria, Methodology, Pathogenic bacteria, Pollution abatement, Sewage bacteria, Treatment, Treatment facilities, Waste treatment, Waste water(Pollution), Water pollution, Water reclamation, Water renovation.

A closed, recycled-water sanitary-waste-disposal system for laboratory study was developed. The system was based on a 1,000-liter capacity, water-filled biodegradation tank. Two specific environmental variables were studied: organic-loading rate of an artificial waste material, based on ground dog-food into the system, and aeration rates imposed on the water column. Two loading rates (2 and 3 persons/day equivalent of sanitary wastes) and two aeration rates (6 and 12 liters/minute) were imposed on the experimental system. Sampling of the tank was carried out on a weekly schedule by sample withdrawal from ports penetrating the tank walls. Data were collected and analyzed for the following biological and chemical parameters: total aerobic and anaerobic standard plate counts, ATP content, total carbon, inorganic carbon, organic carbon, pH, and dissolved oxygen. In addition, the predominant bacterial genera present during the stationary stages of the experimental runs were isolated and identified. Data response curves were created to follow the effects on the

above parameters of the various regimes of loading and aeration during the relatively long-term (about 130 days) experimental runs.

W79-03034

ANALYSIS OF DIFFERENCES IN MUNICIPAL TREATMENT LEVELS.

Environmental Protection Agency, Washington, DC. Office of Analysis and Evaluation.

J. V. Yance.

Water Resources Research, Vol 14, No 6, p 993-1002, December 1978. 2 fig., 3 tab., 28 ref.

Descriptors: *Waste water(Pollution), *Regression analysis, *Treatment levels, Treatment facilities, Economics, Effects, Programs, Investment, United States, Equations, Costs, Assimilative capacity, Urban development, Systems analysis, Cities.

Effluent charges are often proposed as the best way to insure that environmental costs will be internalized by the discharger. However, even in the absence of such charges, municipal treatment plants have been constructed for many years, an indication that to a significant degree, states and communities have internalized the pollution costs of waste water discharges. The motivation for such investments varies widely, however, since before secondary treatment became a Federal requirement, the percentage of the sewer population in a state receiving such treatment ranged from 9 in New Hampshire to 100 in New Mexico. Using regression techniques, this analysis explains 40-45% of the variation in treatment levels among states in 1968 in terms of factors such as the availability of assimilative capacity relative to waste loads and the recency of urban development. The results of state and local programs appear to have been rational, broadly speaking, more extensive treatment being applied where pollution impacts would be greater. Some of the economic implications of the construction grant program, which provides an added incentive for treatment plant investment, are discussed in the light of these results. (Bell-Cornell)

W79-03079

SERIES INTERMITTENT SAND FILTRATION OF WASTEWATER LAGOON EFFLUENTS.

Utah State Univ., Logan.

D. W. Hill, J. H. Reynolds, D. S. Filip, and E. J. Middlebrooks.

Report PRWR153-1, Utah Water Research Laboratory, College of Engineering, Utah State University, Logan, Utah, March 1977. 89p., 12 fig., 56 tab., 87 ref., 2 appen.

Descriptors: *Sands, Filtration, *Wastewater(Pollution), *Lagoons, *Effluents, Water quality, Standards, Treatment facilities, Equations, Design criteria, Economic analysis, Loading rates.

Previous researchers have found single stage intermittent sand filtration to be a feasible and economic means of upgrading wastewater lagoon effluent to meet future standards. However, the major constraint on their use has been the length of the filter runs. Laboratory scale and pilot-scale series intermittent sand filtration of wastewater lagoon effluents has been found to substantially increase the length of the filter runs as well as produce a high quality effluent able to meet future standards. Higher loading rates were found to be possible with series intermittent sand filtration. The operation consistently produced an effluent meeting present Utah 'Class C' water quality standards for BOD, (greater than or equal to 5 mg/l), and the operation also consistently met the 1980 Utah wastewater treatment plant effluent standard for suspended solids (greater than or equal to 10 mg/l). (Bell-Cornell)

W79-03089

CONCENTRATION EFFECTS ON SEPARATION SELECTIVITY IN FOAM FRACTIONATION.

Polytechnic Inst. of New York, Brooklyn. Dept. of Chemistry.

E. J. Chou, and Y. Okamoto. Separation Science and Technology, Vol. 13, No. 5, p 439-448, 1978. 4 fig., 3 tab., 16 ref.

Descriptors: *Surfactants, *Chelation, *Metals, *Foam fractionation, *Competition, Cadmium, Nickel, Foam separation, Ions, Spectrophotometry, Tensiometers, Surface tension, Waste water treatment, Industrial wastes.

A polyalkylenepolyamine was employed as a chelating surfactant for foam fractionation of metallic ions from aqueous solutions. When 4-dodecyldiethylenetriamine was used as the chelating surfactant, selective removal of Cd(+2), Ni(+2), and Cu(+2) form aqueous solution was a function of the metal and surfactant concentrations. A deionized metal-bearing solution with an adjusted pH was mixed with the surfactant in a separation unit; water-saturated compressed air was bubbled through the solution. Metal concentrations in the foamate and residue were measured by atomic absorption spectrophotometry; surface tensions were calculated with a tensiometer. When the surfactant concentration exceeded the total metal ion concentration in solution, Ni(+2) complexed with the surfactant more readily than Cu(+2), indicating that Ni(+2) was selectively removed during foaming. The reverse was found true when the metal ion concentration was increased. Cu(+2) completed more readily for surfactant complex formation; bubbles enhanced Cu(+2) removal. Ni(+2) and Cd(+2) were no as readily removed under higher ionic concentrations. In solutions containing Cd(+2), Cu(+2), and Ni(+2) with higher total concentrations that the chelating agent, the order of selective removal was Cu(+2) > Ni(+2) > Cd(+2). When the surfactant concentration increased, the removal order was reversed to Cd(+2) > Ni(+2) > Cu(+2). (Lisk-FIRL)

W79-03096

THE EFFECT OF TEMPERATURE CONTROL ON BIOLOGICAL WASTEWATER TREATMENT PROCESSES.

Purdue Univ., Lafayette, IN. School of Mechanical Engineering.

C. E. Collins, F. P. Incropera, and C. P. Grady, Jr. Water Research 1978, Vol. 12, p. 547-554, 9 fig., 33 ref. OWRT A-042-IND (5).

Descriptors: *Waste water treatment, *Biological treatment, *Temperature, Activated sludge, *Waste treatment, Sludge treatment, Mathematical model, Solids retention time.

A model has been developed to simulate the effect of temperature control on the performance of a completely mixed activated sludge wastewater treatment system. From calculations based on the model it is demonstrated that effluent quality is significantly improved for any increase in temperature from 10 degrees to 30 degrees C, irrespective of solids retention time (SRT) and sludge settling characteristics. A trade-off exists concerning the effects of temperature on the sludge disposal and oxygen requirements of the system. Although any increase in temperature above 20 degrees C will significantly reduce the sludge production rate, it will also contribute to increased air flow power requirements. The results suggest that a suitable compromise may be reached with a temperature between 23 and 27 degrees C and an SRT between 8 and 14 days. (W79-03110)

KINETICS OF WET OXIDATION OF NYLON 66.

Connecticut Univ., Storrs. Dept. of Chemical Engineering.

D. W. Sundstrom, A. J. Luciano, and H. E. Klei. Journal of Applied Polymer Science, Vol. 20, p 207-216, 1976. 7 fig., 9 ref. OWRT A-019-CONN(3), OWRT 14-01-0001-1075.

Descriptors: *Waste disposal, *Oxidation, *Polymers, *Degradation(Decomposition), Activation energy, Temperature, Mass transfer, *Polymer waste degradation, *Aqueous phase oxidation,

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

*Wet oxidation, *Nylon 66, *Reaction kinetics, *Rotating disc geometry, Dissolved oxygen concentration.

The kinetics of the aqueous phase oxidation of nylon 66 was studied at temperatures up to 190°C. The nylon 66, in the form of a cylindrical disc, was attached to the shaft of a variable-speed drive inside the reactor. With a rotating disc geometry, the chemical kinetics of the surface reaction can be separated from the mass transfer effects. By measuring the reaction rates at different temperatures, pressures and disc rotational speeds, a kinetic rate expression was developed relating nylon degradation to dissolved oxygen concentration and temperature. The order of reaction with respect to dissolved oxygen concentration was 0.6, and the activation energy was 42 kcal/g-mole. (de Laros, Conn)
W79-03125

NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,
Nova Scotia Technical Coll., Halifax. Dept. of Bio-Resources Engineering.
K. V. Lo, and J. T. Clayton.
Canadian Agricultural Engineering, Vol. 20, No. 1, June 1978. p 64-69. 3 fig, 8 tab, 7 ref.

Descriptors: *Nutrient removal, *Soils, *Land treatment, *Land application, *Waste water treatment, *Phosphates, *Nitrogen, *Denitrification, *Water purification, Effluents, Ammonia, Hydrogen ion concentration, Soil contamination, Ninigrit sandy load, Hinckley sand, Canada, Water quality standards, Soil columns, Absorption, Water reuse, Potable water.

Soil columns of Ninigrit sandy loam and Hinckley sand were used to study effects of effluent application rate and frequency on wastewater renovation through soil media. Attempts were also made to determine nutrient absorptive properties of Ninigrit sandy loam; under equilibrium batch conditions, ammonium absorption on the soil can be expressed by the Freundlich absorption isotherm. In pH ranges common to wastewaters (about 7.0) nitrate absorption on the soil was insignificant. Column test results showed that all soil columns removed 99% or more phosphate; phosphate from the secondary effluent applied accumulated in the top 2.5-5.0 cm of the soil columns, depending on loading. At the end of the 12-week test period, nitrogen concentrations in all filtrates achieved the Canadian drinking water standard of 10 ppm nitrate-nitrogen. Columns with five cm/wk application had the best nitrogen removal, about 80%. Columns with 10 and 20 cm/wk application rates had nitrogen removals ranging 63-74%. If crops were incorporated into the system, nitrogen removal efficiency would probably be higher. Tests results also showed that denitrification could have been significant in nitrogen removal. Total nitrogen loss in the soil columns amounted to about 65-80% of the nitrogen input from wastewater, a portion of which must be due to denitrification. (Lynch-Wisconsin)
W79-03178

THE FATE OF NON-COMPLIANT MUNICIPALITIES WITH REGARD TO THE SECONDARY TREATMENT STANDARDS PURSUANT TO THE 1972 FEDERAL WATER POLLUTANT CONTROL ACT AMENDMENTS - A PROBLEM OF ENFORCEMENT,
For primary bibliographic entry see Field 6E.
W79-03208

INACTIVE AND ABANDONED UNDER-GROUND MINES. WATER POLLUTION PREVENTION AND CONTROL,
Baker (Michael), Jr., Inc., Beaver, PA.
For primary bibliographic entry see Field 5G.
W79-03247

RECYCLING ZINC IN VISCOSE RAYON PLANTS BY TWO STAGE PRECIPITATION,
Environmental Protection Agency, Cincinnati,

OH. Office of Technology Transfer.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 136, Price Codes: A02 in paper copy, A01 in microfiche. Report No. EPA-625/2-73-001a, December 1972. 12 p, 6 fig, 3 tab.

Descriptors: *Waste treatment, *Recycling, *Zinc, Industrial wastes, Water pollution sources, Separation techniques, Neutralization, Cost-benefit analysis, Economics, Viscose rayon industry, Sludge, Textiles, Chemical precipitation.

A method for recovering zinc in rayon process sludge was proven. The recovered zinc, recycled to the rayon manufacturing plant, showed no adverse effects on the rayon yarn. The zinc recovery process involves two stage precipitation with the second precipitation under careful pH control using sodium hydroxide in a circulating slurry of zinc hydroxide crystals. This recovery system enhances the economics of zinc pollution control; allows neutralization of the acid stream; and the recovery of the zinc results in a profit for industrial yarns and a moderate cost for textile yarns. (Davidson-IPA).
W79-03249

FEDERAL GUIDELINES: PRETREATMENT OF POLLUTANTS INTRODUCED INTO PUBLICLY OWNED TREATMENT WORKS,
Environmental Protection Agency, Washington, DC. Office of Water Program Operations. October 1973. 160 p, 45 tab, 94 ref, 4 append.

Descriptors: *Waste water treatment, *Pretreatment(Water), Publications, *Federal Water Pollution Control Act, Industrial wastes, Municipal wastes, Treatment facilities, Effluents, Water pollution treatment, Water pollution control, Pollutant identification, Biochemical oxygen demand, Phosphorus, Phosphorus compounds, Nitrogen, Nitrogen compounds, Legislation, Regulation.
W79-03254

The Federal Water Pollution Control Act Amendments of 1972 (P.L. 92-500) requires the promulgation of guidelines for the pretreatment of waste waters to be discharged to publicly owned treatment works. The relationship between pretreatment and the effluent limitations is distinguished. Information is presented on effluent limitations for National Pollutant Discharge Elimination Systems (NPDES) municipal permit; effluent limitations for publicly owned treatment works; and joint treatment and pretreatment. Basic pretreatment policy considerations for the development of these guidelines include: joint treatment, where it is economical; in-plant measures for reducing the quantity and strength of industrial waste waters; pretreatment to remove compatible pollutants is not required by the Federal standards; and state and municipal pretreatment requirements should be tailored to the specific limitations of the individual treatment works. Federal, state and local pretreatment standards are discussed. Appendix D identifies waste water characteristics and pretreatment unit operations for 22 industrial groups. (Davidson-IPA)
W79-03250

CONSTRUCTION GRANTS PROGRAM INFORMATION: INDUSTRIAL COST RECOVERY SYSTEMS,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-03262

WASTE CLEARINGHOUSE AND EXCHANGES: NEW WAYS FOR IDENTIFYING AND TRANSFERRING REUSABLE INDUSTRIAL PROCESS WASTES,
Little (Arthur D.), Inc., Cambridge, MA.
R. C. Terry, Jr., J. B. Berkowitz, C. M. Mohr, J. P. Tratnyek, and J. T. Funkhouser.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 287, Price codes: A07 in paper copy, A01 in microfiche. Final Report No. 3, SW-130c and C-78494, October 1976. 147 p, 9 fig, 21 tab, 22 ref, 6 append. 68-01-3241.

Descriptors: *Waste disposal, *Waste treatment, *Recycling, Waste identification, Chemical wastes, Industrial wastes, Solid wastes, Liquid wastes, Legal aspects, Financing, Transfer, Information exchange, Data collection, Marketing.

An assessment of the feasibility and potential impact of transferring wastes in the U.S. is reported, and guidelines for organizing and operating a waste transfer organization are provided. From an investigation of existing European 'waste exchanges' it was determined that there are two types of transfer agents: (1) the information clearinghouse which transfers information only, and (2) the materials exchange which accepts residues, analyzes them, identifies new uses, renders necessary treatment, and actively seeks buyers. Concepts and requirements for transferring wastes are analyzed; a distinction is made between 'trash waste,' which has no reuse value, and 'scrap waste,' which can be reused. Quantities of industrial process wastes suitable for transfer are estimated for the Philadelphia Standard Metropolitan Statistical Area. Industries manufacturing chemicals or using chemicals as raw materials produces wastes suitable for transfer services. These industry types are: pharmaceuticals; paint and allied products; organic and chemicals; petroleum refining; and small industry machinery. Industries with a need for fuels or cleaning solvents are potential users of scrap wastes. The techniques and procedures for successful transfer of reusable wastes are examined. Financial and legal aspects for these organizations are discussed. (Davidson-IPA)

W79-03254

A STUDY OF COAL-ASSOCIATED WASTES RESULTING FROM THE MINING, PROCESSING AND UTILIZATION OF COAL,
West Virginia Univ., Morgantown. Coal Research Bureau.
For primary bibliographic entry see Field 5G.
W79-03255

METHANOL TREATED ACTIVATED SLUDGE AS AN AGRICULTURAL CHEMICAL CARRIER,
Department of Agriculture, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03262

GUIDANCE FOR PREPARING A FACILITY PLAN, MUNICIPAL WASTEWATER TREATMENT WORKS, CONSTRUCTION GRANTS PROGRAM,
Environmental Protection Agency, Washington, DC. Municipal Construction Div.
For primary bibliographic entry see Field 5G.
W79-03263

DEVELOPMENT OF AN ON-LINE ORGANIC ANALYZER FOR THE MUST WATER PROCESSING ELEMENT,
Abcor, Inc., Wilmington, MA. Walden Div.
For primary bibliographic entry see Field 5A.
W79-03264

ALTERNATIVE INSTITUTIONAL AND FINANCIAL ARRANGEMENTS FOR AREAWIDE WASTE TREATMENT MANAGEMENT,
Banks (Harvey O.) Consulting Engineer, Inc., Belmont, CA.
For primary bibliographic entry see Field 5G.
W79-03265

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR ALDRIN/DIELDRIN MANUFACTURE,
Midwest Research Inst., Kansas City, MO.
A. F. Meiners, C. E. Mumma, T. L. Ferguson, and G. L. Kelso.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-254 011, Price codes: A07 in paper copy, A01 in microfiche. Final Report No. 3, SW-130c and C-78494, October 1976. 147 p, 9 fig, 21 tab, 22 ref, 6 append. 68-01-3241.

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

Price Codes: A03 in paper copy, A01 in microfiche. Final Report Nos. EPA-440/9-76-007 and MRI-4127-C, February 6, 1976. 46 p, 2 fig, 2 tab, 22 ref, 1 append. 68-01-3524.

Descriptors: *Waste water treatment, *Industrial wastes, *Aldrin, *Dieldrin, Cost analysis, Cost comparisons, Documentation, Evaporation, Waste water disposal.

Although the pesticides, aldrin and dieldrin, are not currently manufactured in the U.S., recent events concerning the pesticides are presented, manufacturing processes are reviewed and in-plant controls are described. Shell Chemical Co., was formerly the sole U.S. manufacturer of aldrin and dieldrin and used a waste water disposal system that consisted of a 100-acre asphalt-lined evaporation basin located on the Denver, Colorado, plant grounds. If production were resumed at the Shell facility, this system is considered adequate to achieve zero discharge of any waste generated. Since a limited market for aldrin may continue to exist in the future there is a possibility that Shell may reopen the Denver plant or construct a new plant or that another company may consider manufacturing aldrin. Considering this, the design of an evaporation pond for waste water disposal at a new aldrin manufacturing plant and related costs are examined. (Gibson-IPA). W79-03267

JPL ACTIVATED CARBON TREATMENT SYSTEM (ACTS) FOR SEWAGE,

Jet Propulsion Lab., Pasadena, CA.

R. E. Lewis, J. K. Kalvinskas, and W. Howard. Available from the National Technical Information Service, Springfield, VA 22161 as N76-20697, Price Codes: A06 in paper copy, A01 in microfiche. Report No. NASA-CR-146572, February 10, 1976. Presented at California Water Pollution Control Association Northern Regional Conference, Stockton, October 10, 1975. 30 p, 4 fig, 21 tab, 3 ref. NAS7-100.

Descriptors: *Waste treatments, *Municipal wastes, *Sewage treatment, *Activated carbon, Activated sludge, Sewage, Filtration, Dewatering, Sludge treatment, Treatment facilities, Sludge disposal, Pilot plants, Estimated costs, Orange County Sanitation District, California, Laboratory testing.

The development of an Activated Carbon Treatment System (ACTS) for municipal sewage is discussed. Initial work included laboratory testing and research, development of a 10,000 gallon/day demonstration plant, and pilot plant equipment tests. Procedures involved in the ACTS sewage operation include: carbon-sewage treatment, primary and secondary clarifiers, gravity (multi-media) filter, filter press dewatering, flash drying of carbon-sewage filter cake, and sludge pyrolysis and activation. Construction of the 1 million gallon/day pilot plant at Orange County Sanitation District employing this system was expected to be completed by February 1976. Preliminary economic estimates indicate that this process provides a capital cost savings up to 25% over competitive sewage treatment in meeting projected ocean discharge standards. (Davison-IPA). W79-03268

DESTRUCTION OF POLYCHLORINATED BI-PHENYLS IN SEWAGE SLUDGE DURING INCINERATION,
Versar, Inc., Springfield, VA.
For primary bibliographic entry see Field 5E. W79-03269

IN WHAT WAY IS WATER POLLUTION INFLUENCED BY SEWERAGE SYSTEMS,
DHV Consulting Engineers, Amersfoort (Netherlands).
For primary bibliographic entry see Field 5B. W79-03298

WASTEWATER REUSE BY BIOLOGICAL CHEMICAL TREATMENT AND GROUND-WATER RECHARGE,

Water Planning for Israel Ltd., Tel-Aviv. Dept. of Sewage Reclamation.

E. Idelovitch.

Journal of the Water Pollution Control Federation, Vol. 50, No. 12, p 2723-2739, December 1978. 10 fig, 4 tab, 33 ref.

Descriptors: *Water reuse, *Groundwater recharge, *Waste water treatment, Water treatment, Groundwater, Recharge, Treatment, Irrigation, Projects, Municipal wastes, Sewage, Water quality, Potable water, Wells, Water wells, *Israel, Nonpotable reuse.

The approach of indirect nonpotable reuse of municipal wastewater, after biological-chemical treatment and groundwater recharge, was adopted in Israel for the Dan Region Project—Stage I. Its implementation involves conversion of the country's southern water supply and nonpotable water, mainly for irrigation. Chemical treatment, consisting of the high lime-magnesium process followed by detention of the effluent in polishing ponds (primarily for ammonia stripping and re-carbonation), efficiently removes phosphorus, ammonia and total nitrogen, organics, trace elements including boron and fluorides, and bacteria and viruses from oxidation pond effluent. The removal efficiency of the process is higher in summer than in winter. Groundwater recharge provides for seasonal storage, additional purification of the effluent by a variety of processes taking place in the soil and in the aquifer, and dilution with high-quality natural groundwater. The reclaimed water fulfills the quality requirements of unrestricted crop irrigation and of a wide variety of industrial uses; it also satisfies most of the requirements of prevailing drinking water standards. (Sims-ISWS) W79-03305

CONTINUOUS SEWAGE SLUDGE HEAT TREATMENT APPARATUS,

G. Nakamura.

U.S. Patent No. 4,110,217, 5 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol 97, no 5, p 2312, August 29, 1978.

Descriptors: *Patents, *Sewage treatment, *Waste water treatment, Sewage disposal, Sludge treatment, Steam, Heat treatment, Equipment.

A sewage disposal apparatus is described for continuous heat treatment of sludge delivered from the final settling tank of a sewage disposal system on a large industrial scale. The object of the invention is to treat sludge with steam of relatively low pressure and temperature without requiring a substantially long period of aging. Since the treatment is run continuously it requires a smaller sized vessel. The apparatus has an axially porous member within a vertical vessel and radial apertures in the side wall of the vessel so that almost all of the sludge is exposed to and thus heated with steam supplied through the radial apertures. The sludge is fed into the head of the vessel and falls down in the form of thin strings through axial pores and hits the tail of the vessel. (Sinha - OEIS) W79-03310

NOZZLE FOR ROTARY FILTER PIPE,

For primary bibliographic entry see Field 5F. W79-03315

METHOD OF IMPROVING THE BACKWASHING OF FIXED BEDS FORMED OF GRANULAR MATERIALS,

Sulzer Bros. Ltd., Winterthur (Switzerland). (Assignee).

I. Sekoulou, and W. R. Muller.

U.S. Patent No. 4,113,612, 7 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 97, no 2, p 932, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Water purification, *Water pollution treatment,

Activated carbon, Adsorption, Filtration, Equipment, Gases, *Backwashing.

A method improves the backwashing of fixed beds formed of granular materials and used during waste water purification or water treatment. The fixed bed, during the course of the backwashing is maintained during a predetermined time duration filled with a quiescent liquid. This liquid contains at least one substance which is distributed as uniformly as possible. In the presence of a spontaneous, catalytically triggered decomposition reaction, this substance releases a gaseous component. Then, the fixed bed is backwashed with water. (Sinha - OEIS)
W79-03316

METHOD FOR OBTAINING SUBSTANTIALLY COMPLETE REMOVAL OF PHENOLS FROM WASTE WATER,

Exxon Research and Engineering Co., Linden, NJ. (Assignee).

M. L. Gorbaty.

U.S. Patent No. 4,113,615, 11 p, 2 fig, 7 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 97, no 2, p 933, September 12, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Organic wastes, *Phenols, Adsorption, Hydrogen ion concentration, Coal, Char, Coal gasification plants.

Substantially complete removal from waste water of phenols and other organic compounds that dissociate in solution to produce organic anions and hydrogen ions can be obtained by contacting the waste water with char derived from a carbonaceous material whose ash contains a total of at least 15 weight percent calcium, magnesium, potassium and sodium expressed as oxides on a moisture free basis. The pH of the resultant slurry is maintained at a value such that the ratio of the highest dissociation constant of the organic compounds present to the hydrogen ion concentration of the slurry is less than about 0.1, and purified waste water is recovered. The char suitable for use as the adsorbent may be any carbonaceous product resulting from the partial thermal process of coal or other carbonaceous material. The material may be obtained from the carbonization, gasification, pyrolysis or liquefaction of coal. It is particularly advantageous to use char fines carried overhead with the product gas produced in a fluid bed gasifier as the adsorbent. Such utilization of the unconverted carbon in the fines enhances the economics of both the gasification process and the waste water treating process. (Sinha - OEIS)

W79-03317

BRINE PURIFICATION PROCESS,

Allied Chemical Corp., Morristown, NJ. (Assignee).

A. B. Gancy, and C. J. Kaminski.

U.S. Patent No. 4,115,219, 8 p, 1 fig, 1 tab, 6 ref; Official Gazette of the United States Patent Office, Vol 97, no 3, p 1473, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, Chemical wastes, Separation techniques, Chemical precipitation, *Brines, Water quality control, Product recovery.

An improved process for the purification of raw sodium chloride brines containing dissolved impurities including strontium, calcium and magnesium comprises (a) contacting the raw brine with sodium carbonate and solids recycled from step (d) for formation of strontium carbonate and calcium carbonate solids, (b) contacting the treated brine containing the carbonate solids with sodium hydroxide for formation of magnesium hydroxide solids, (c) removing a major portion of the strontium carbonate, calcium carbonate and magnesium hydroxide solids to provide a purified effluent and (d) recycling a portion of removed solids for admixture with the raw brine and sodium carbonate in the first step. (Sinha - OEIS)
W79-03319

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5D—Waste Treatment Processes

TREATMENT OF AQUEOUS DISPERSIONS, Monsanto Co., St. Louis, MO. (Assignee). E. J. Griffith.

U.S. Patent No. 4,115,233, 6 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1477, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, Water quality control, Industrial wastes, Electrodes, Cathodes, Anodes, Zeta potential, Equipment, Electroendosmosis, Zonal concentration.

In many industrial processes, aqueous dispersions of solids are obtained as waste streams. Such waste streams often cannot be conveniently disposed of due to material handling difficulties or ecological or safety considerations and are retained in large ponds, holding tanks, or other containment means. However, in the case of many aqueous dispersions, zonal concentration of the solids by settling takes place at an extremely low rate, if at all. This invention provides a process for increasing the rate of zonal concentration. A cathode is placed intermediate between a first cathode and anode. A direct current electrical potential is provided so that electroendosmosis may be used to increase the density of solids within the aqueous dispersion. The process and apparatus are for use on large impoundments (greater than 100 sq. m area). (Sinha - OEIS) W79-03320

TREATMENT OF SEWAGE,

K. C. Smith, and M. E. Garrett.

U.S. Patent No. 4,115,258, 6 p, 1 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1485, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Water pollution treatment, Oxygen, *Oxidation, Biochemical oxygen demand, Hydrogen sulfide, Sewage.

Pure oxygen or a gas containing substantially more oxygen than air is injected under pressure into sewage held in or flowing through a rising or pumping sewer. This injection may be used to prevent the concentration of dissolved oxygen in the sewer falling to a level at which there occurs bacterial reduction to hydrogen sulphide or sulphate present in the sewage and/or to reduce the Biochemical Oxygen Demand of the sewage. The injection can also be used to oxidize to sulphur and sulphide dissolved in the sewage. The pure oxygen or the gas containing more oxygen than air may be injected into sewage flowing through a sewage pipe forming part of a rising or pumping sewer, into a pump used to transfer the sewage through the sewer, or into a part of the sewer (e.g. a sump) where sewage is collected before being transferred through the sewer. (Sinha - OEIS) W79-03321

SELECTIVE REMOVAL OF IRON CYANIDE ANIONS FROM FLUIDS CONTAINING THIOCYANATES,

Rohm and Haas Co., Philadelphia, PA. (Assignee).

N. L. Avery.

U.S. Patent No. 4,115,260, 7 p, 2 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1486, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, *Water pollution treatment, *Industrial wastes, *Separation techniques, Ion exchange, Anion exchange, Inorganic compounds, Resins, Regeneration, *Cyanides.

The process of this invention comprises (a) contacting an aqueous fluid containing iron cyanide complex anions and other common ions including thiocyanate ions with a strongly basic, acrylic-based anion exchange resin to remove the iron cyanide complex anions from the fluid, (b) separating the resin containing the bound iron cyanide complex anions from the treated fluid containing the thiocyanate and other common ions, (c) regenerating the resin by contacting it with a brine solution to replace the adsorbed iron cyanide complex anions, (d) separating the spent regenerant contain-

ing the iron cyanide complex anions from the regenerated resin, which is now ready for re-use, and (e) where the resin particles form a bed or mass through which the treated fluid and regenerant flow, separating that portion of the regenerant which elutes later, and re-using the late-eluting portion without further treatment to regenerate spent resin. (Sinha - OEIS) W79-03322

PROCESS FOR TREATING DRINKING WATER AND SEWAGE,

For primary bibliographic entry see Field 5F.

W79-03323

METHOD OF PURIFYING POLLUTED WATER,

Phillips Petroleum Co., Bartlesville, OK. (Assignee).

W. C. McCarthy, and R. O. Dunn.

U.S. Patent No. 4,115,264, 6 p, 1 fig, 1 tab, 8 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1487, September 19, 1978.

Descriptors: *Patents, Water pollution treatment, *Waste water treatment, *Organic wastes, Water purification, *Oxidation, Catalysts, Alkali metals, Catalytic oxidation.

This invention provides an improved process for the catalytic oxidative purification of organically polluted waters. The life of a catalyst employed in the catalytic oxidation of organically polluted waters containing negligible amounts of alkali metal is extended by increasing the alkali metal concentration prior to subjecting the water to the catalytic oxidation. This invention is generally applicable to any aqueous phase and the catalyst and process conditions employed are those known in the art. (Sinha - OEIS) W79-03324

WASTE WATER TREATMENT ROTOR,

C. P. Thissen.

U.S. Patent No. 4,115,268, 8 p, 10 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 974, No. 3, p 1488, September 19, 1978.

Descriptors: *Patents, *Waste water treatment, Water pollution treatment, *Biological treatment, Equipment, Aeration, Aerobic conditions, Slime, *Biochemical oxygen demand.

The biological treatment of waste water for the removal of BOD involves the use of one or more partially submerged bodies forcibly rotated to expose the organisms on the contact surfaces to the atmosphere for the absorption of oxygen. The growth of the biological slimes on the surfaces of the rotating contactor is thereby encouraged. The lower half of the rotor is immersed in the waste water and the upper half is out of the waste water and exposed to the air. This invention incorporates in the biological treatment rotor, a stiff laminar or sheet material of an inert plastic material such as polyethylene which is provided with a multiplicity of irregularities or cup-like recesses spread substantially over its face. The sheet material is wrapped spirally around a central shaft so that there is a substantial number of flow passages for waste water and air in directions parallel to the axis and also around the periphery. Overall, the rotor is generally cylindrically shaped and the multiplicity of convolutions of the sheet material are maintained in spaced relation by the cup-shaped recesses. (Sinha - OEIS) W79-03325

METHOD FOR RECOVERING VARIABLE-VALENCY ELEMENTS AND PURIFYING SEWAGE WATERS,

Anic S.p.A., Palermo (Italy). (Assignee).

G. Generini.

U.S. Patent No. 4,116,783, 3 p, 5 ref; Official Gazette of the United States Patent Office, Vol 974, no 4, p 2015, September 26, 1978.

Descriptors: *Patents, *Waste water treatment, *Sewage treatment, *Separation techniques, Heavy metals, Oxidation, Reduction(Chemical), Electrolysis, *Metals, Ore treatment plants, Vanadium, Product recovery.

A method for stripping pollutant metals from sewage waters from ore-treatment installations is disclosed, which comprises the step of using, in a short-circuited electrode system through which the waters to be purified are flowed, a compound of an element which is other than the cathode metal and is more electro-positive than the anode element. Striking results are obtained by treating vanadium-containing sewage waters from gallium-ore treatment plants with silver sulfate in a copper-ion electrode system. The method can be employed to recover other transition metals from liquors which contain them. (Sinha - OEIS) W79-03330

WATER PURIFICATION METHODS, International Telephone and Telegraph Corp., Nutley, NJ. (Assignee). For primary bibliographic entry see Field 5F. W79-03331

APPARATUS FOR INCREASING THE pH OF WASTE WATER,

Mine Safety Appliances Co., Pittsburgh, PA. (Assignee).

E. C. King.

U.S. Patent No. 4,116,834, 4 p, 3 fig, 4 ref; Official Gazette of the United States Patent Office, Vol 974, No 4, p 2031, September 26, 1978.

Descriptors: *Patents, *Waste water treatment, *Acid mine water, *Water pollution treatment, *Hydrogen ion concentration, Lime, Mixing, Equipment, Sensors.

There are situations in which it is desirable to treat waste water in order to increase its pH and to hold it at a predetermined value. For example, it is desirable to neutralize acid mine drainage in this way. The object of this invention is to provide an apparatus which is relatively simple in design. Lime from a hopper is fed to a lime slurry tank by a variable speed feeder. The tank receives water from a conduit in which there is a throttle valve and a flowmeter. Slurry from the tank is delivered to a mixing tank that has an inlet for untreated waste water and an outlet for treated waste water. A sensor responsive to the pH of treated waste water leaving the mixing tank controls a device for operating the throttle valve, and the flowmeter controls a device for operating the lime feeder to keep the concentration in the slurry tank substantially constant regardless of the rate of flow out of that tank. (Sinha - OEIS) W79-03333

BIOLOGICAL NITRIFICATION AND DENITRIFICATION USING ROTATING BIOLOGICAL CONTACTORS,

Northeastern Univ., Boston, MA. Dept. of Civil Engineering.

J. C. O'Shaughnessy, F. C. Blanc, P. Brooks, D. Connick, and A. Silbovitz.

Massachusetts Water Resources Research Center, University of Massachusetts, Amherst, WRRC Publication No. 97, July 1978. 107 p, 32 fig, 9 tab, 9 ref, 4 append. OWRT A-083-MASS(1), 14-34-0001-6022, 14-24-0001-7046.

Descriptors: *Biological treatment, *Denitrification, *Nitrification, *Waste water treatment, Aerobic bacteria, *Rotating biological contactors.

This study evaluated the ability of Rotating Biological Contactors (RBC) to provide biological nitrification and denitrification of secondary treated domestic wastewater. The study involved both bench scale and pilot scale testing. The results indicated that the ammonia nitrogen application rate and volume to surface ratio of the unit are major design parameters to achieve proper nitrification with RBC units. Ninety four percent ammonia conversion was observed for an ammonia load-

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Waste Treatment Processes—Group 5D

ing rate of 0.20 lbs. NH₃-N/l 1000 ft²-day. In order to achieve a high degree of nitrification a minimum of two stages should be used in RBC unit design, and supplemental alkalinity addition may be required. The denitrification study indicated that RBC units can be used to achieve biological denitrification of domestic wastewater. (Godfrey-Mass)
W79-03383

PURIFICATION OF PAPER-MILL WASTE WATERS WITH MODERN DEVICES (PAPÍRGYARI SZENNYVIZEK TISZTITASA KÖRZERÜ BERÉNDZÉSEKKEL),

Papiripari Vallalat Kutato- és Fejlesztointezete, Budapest (Hungary).

L. Ligeti.

Papiripari, Vol. 22, No. 3, p 93-100, 1978. 3 fig. 14 ref. 3 tab.

Descriptors: *Pulp wastes, *Waste water treatment, Costs, Economics, Industrial water, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Water purification, Amortization, White water(Paper machines), Closed systems, Water reuse.

The suitability of the Float Wash and Bauer Hydrasieve devices for treatment of high-solids paper machine white waters in closed-circuit paper mills was investigated. Despite their different operating principles, both devices were found suitable for economical effluent purification; the Hydrasieve seemed better suited for cleaning suspensions with higher solids contents (long fibers and fiber bundles), while the Float Wash apparatus seemed more adequate for lower-solids paper machine white waters. The clarified water should, however, be subjected to a second purification stage before being recirculated for reuse. Depending on the quality and volume of white water to be treated, both devices can be amortized within 2-4.5 years. (Brown-IPC)
W79-03384

THE CLOSED-CYCLE BLEACHED KRAFT PULP MILL,

B E and K, Inc., Birmingham, AL.

For primary bibliographic entry see Field 3E.
W79-03385

KINETICS FOR ACTIVATED SLUDGE PROCESS DESIGN: EXPERIMENTAL APPLICATION TO STRAW PAPER WASTEWATER TREATMENT,

Genov Univ. (Italy). Tecnologie dell'Ingegneria Chimica; and Genoa Univ. (Italy). Ist. di Scienze. M. Del Borghi, G. Migliorini, G. Isola, and G. Ferraioli.

Biotechnology and Bioengineering, Vol. 20, No. 2, p 203-215, February, 1978. 11 fig. 20 ref. 2 tab.

Descriptors: *Pulp wastes, *Waste water treatment, *Activated sludge, *Kinetics, Wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Model studies, Industrial wastes, Microbial degradation, Design, Straw paper.

Degradation kinetics for the treatment of straw paper waste water in an activated sludge process are studied and a kinetic model is derived for both batch and continuous experiments. These two methods are reasonably equivalent only when rather low concentrations of substrate are involved. Both models, however, show a dependence upon concentration corresponding to that which is typical of multicomponent substrate degradation. The kinetic model derived from continuous tests appears to be more suitable for designing industrial processes in that it avoids oversizing of the aeration unit. (Swichtenberg-IPC)
W79-03386

ONE MILL'S APPROACH TO EFFLUENT TREATMENT,

Bowater Scott Corp. Ltd., Northfleet (England).

T. Winship.

In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper No. 17, 10 p. 3 fig.

Descriptors: *Waste water treatment, *Pulp and paper industry, *England, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp wastes, Foreign countries, Screens, Fiber recovery, Flocculation, Activated sludge, Polyelectrolytes, Water reuse, Recycling, Water conservation, Water consumption(Except consumptive use), Industrial water, Aluminum sulfate.

Effluent treatment at the creped-paper mill of Bowater Scott Corp. Ltd. (United Kingdom) consists of Kenfil inclined screens for fiber recovery and Ceca-Wabag contact flocculators to remove fines from the effluent streams in the presence of alum, polyelectrolytes, and activated sludge. The supernatant from the flocculators is pumped back to the paper mill for reuse by the Yankee tissue machines. Fresh water consumption and total fiber loss have been reduced by about 45 and 70%, respectively. (Swichtenberg-IPC)
W79-03391

NEW PROCESS FOR TREATING BLEACHING EFFLUENTS FROM CHEMICAL PULP MILLS (NOUVEAU PROCEDE DE TRAITEMENT DES EFFLUENTS DE BLANCHIMENT DES USINES DE PATES CHIMIQUES),

Centre Technique de l'Industrie des Papiers, Cartons et Celluloses, Grenoble (France).

M. Pichon, E. Muratore, and P. Monzie. French Patent No. 2,365,523. April 21, 1978. 13 p. 1 fig. 7 claims.

Descriptors: *Bleaching wastes, *Waste water treatment, *Decoloring, *Patents, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Pulp wastes, Lignins, Chlorides, Color, Waste dilution, Organic compounds, Ultrafiltration, Corrosion, Heat balance, Kraft mills.

Bleach plant effluents from kraft pulp mills containing in solution organic colored materials stemming especially from lignin and its degradation products on one hand and mineral chlorides in significant quantities on the other hand are subjected to decoloring with separation of the colored organic materials in a concentrated form. This is followed by aqueous dilution of the separated colored organic concentrate, preferably using an effluent poor in aqueous chlorides. The diluted concentrate is then subjected to ultrafiltration to obtain a final concentrate with a mineral chloride content low enough to be recycled for heat recovery without risk of excessive corrosion. (Speckhard-IPC)
W79-03394

PROCESS FOR TREATING MATERIALS SUCH AS COMBUSTIBLE SLUDGES IN A FLUIDIZED-BED REACTOR (PROCEDE DE TRAITEMENT DE MATIERES, TELLES QUE NOTAMMENT DES BOUES COMBUSTIBLES, DANS UN REACTEUR A LIT FLUIDISE),

Ahlistrom (A.) Osakeyhtiö, Helsinki (Finland). For primary bibliographic entry see Field 5E.
W79-03395

POSSIBLE USE OF ELECTROCHEMICAL COAGULATION FOR PURIFICATION OF KRAFT MILL EFFLUENTS (O VOZMOZHnosti PRI-MENENIYA METODA ELEKTROKHIMICHESKOI KOAGULYTSII DLYA OCHISTKI STOCHNYKH VOD SULFFAT-TSELLYULOZO-NOGO PROIZVODSTVA),

G. R. Bochkarev, V. A. Babkin, V. Ya. Fedosova, M. I. Anisimova, and E. N. Serdobolskii.

Izvestiya Sibirskogo Otdeleniya Akademii Nauk SSR, Seriya Khimicheskikh Nauk No. 1, p 148-150, January, 1978. 1 fig. 4 ref. 1 tab.

Descriptors: *Pulp wastes, *Electrochemistry, *Coagulation, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Electrodes, Steel, Anodes, Electric currents, Carbon, Iron, Phenols, Hydrogen ion concentration, Bleaching wastes, Color, Chemical oxygen demand, Effluents, Pulp and paper industry, Kraft mills.

Electrochemical coagulation of kraft mill effluents based on the formation of metal hydroxides during anodic dissolution of metal electrodes was investigated. Rectangular steel electrodes with a working surface of 1.0-3.4 sq cm served as anodes, using a current flow of 100-300 amp-hr/cu m. Purification effectiveness was evaluated by changes in the carbon, iron, and phenol contents and COD measurements before and after purification. The effect of pH on the degree of purification depended on the nature of the effluent. Optimum pH for the purification of effluents from the first alkaline extraction stage after chlorination was 11.5. Other effluents were satisfactorily purified at pH 4.5-7.0. Tabulated data indicated that the carbon content, color, and COD of the effluents were reduced by 70-90%. Phenol content was reduced by 30-60%. Use of electrochemical coagulation for purification of heavily contaminated effluents can reduce the load on biological purification and simplify it. (Chern-IPC)
W79-03396

A FOAM ACTIVATED SLUDGE PROCESS FOR THE TREATMENT OF SPENT SULFITE LIQUOR,

University of Western Ontario, London.

J. E. Zajic, M. A. Hill, D. F. Manchester, and K. Muzika.

Journal Water Pollution Control Federation, Vol. 50, No. 5, p 884-895, May, 1978. 13 fig. 5 ref. 3 tab.

Descriptors: *Sulfite liquors, *Waste water treatment, *Activated sludge, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Pulp wastes, Flotation, Foaming, Biochemical oxygen demand, Biological treatment, Operation and maintenance, Biodegradation, Sludge, Pilot plants, Spent sulfite liquor.

A foam flotation activated sludge process was developed for the biodegradation of spent sulfite liquor, which removed 85% of the BOD from concentrated pulp mill waste having a pretreatment BOD level of 24,000 mg/liter. It is based on an autolytic culture system. The process has no sludge wastage requirement in the autolytic mode associated with maximum BOD removal. When the reactor retention time was decreased from 2.3 to 1.3 days the process became nonautolytic and operated at 50 to 60% BOD removal efficiency, generating biomass as a by-product. The process was operated continuously on a pilot-plant scale for more than 5 months in the autolytic mode. Operating parameters were established at three levels of nutrient chemical additions. (Witt-IPC)
W79-03398

PROCESS OF FLOTATION OF WHITE WATER - THEORETICAL BASES AND PRACTICAL APPLICATION (PROCESSO DE FLOTACAO DE AGUAS BRANCAS - BASES TEORICAS E APlicACAO PRATICA),

Krofta Instalacoes Industriais Ltd. (West Germany).

R. J. Helene. O Papel, Vol. 39, p 31-38, April, 1978. 9 fig. 3 illus. 5 ref.

Descriptors: *Pulp wastes, *Waste water treatment, *Flotation, Effluents, Pulp and paper industry, Water pollution control, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Bubbles, Aeration, Water pollution treatment, White water(Paper machines), Savealls, Industrial water.

This review of flotation savealls discusses physical and chemical phenomena occurring in the flotation of paper-machine white water (flocculation of

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solids and means for rendering them hydrophobic, and the fundamentals of producing disperse air bubbles in white water) and the use of flotation savealls in practice. The Supercell and Sedifloat systems are described. (Speckhard-IPC)
W79-03401

ENVIRONMENTAL PROTECTION ON CANADA'S WEST COAST,
Beak Consultants Ltd., Vancouver (British Columbia).
For primary bibliographic entry see Field 5G.
W79-03403

REFINER PULP MILL EFFLUENT. PART I. GENERATION OF SUSPENDED AND DIS-SOLVED SOLIDS FRACTIONS,
New Zealand Forest Service, Rotorua.
S. R. Corson, and J. A. Lloyd.
Papir ja Puu, Vol. 60, No. 6/7, p. 407-410, 412-413, 1978. 3 fig, 6 ref, 5 tab.

Descriptors: *Waste water treatment, *Pulp wastes, *Dissolved solids, *Suspended solids, *Groundwood mills, Wastes, Industrial wastes, Water pollution sources, Pulp and paper industry, Effluents, Chemical oxygen demand, Water consumption (Except consumptive use), Biochemical oxygen demand, Fibers(Plant), White water(Paper machines).

An investigation of the main process streams in a large refiner mechanical pulp (chip groundwood) mill has given information on the movement of water-soluble components from the wood fiber to the white water and thence to the effluent. The COD of the mill effluent ranged from 2,000 to 3,500 mg/liter, but 100-1,500 mg/liter of this could be eliminated by removal of fiber and fines. The effluent's COD dropped from 45 to 25 kg/ton as the total mill water consumption was reduced from 30 to 15 cu m/ton. The 5-day BOD of the water flows generally followed the same pattern as the COD, except when old chips were being pulped at which time lower BOD levels were measured. (Brown-IPC)

W79-03404

CHLORINATED AND SULFONATED DEGRADATION PRODUCTS OF LIGNIN IN THE EFFLUENTS FROM THE CHLORINE BLEACHING OF SULFITE PULP (CHLORIERTE UND SULFONIERTE LIGNINABBAUPRODUKTE IN ABWAESSERN DER CHLORBLEICHEN VON SULFITZELLSTOFF),
Technische Hochschule, Darmstadt (Germany, F.R.) Inst. fuer Makromolekulare Chemie.
For primary bibliographic entry see Field 5A.
W79-03405

FLOAT-WASH SYSTEM. CLOSING OF THE WATER CIRCULATION SYSTEM IN THE PULP AND PAPER INDUSTRY (FLOAT-WASH SYSTEM. SCHLIESSEN DES WASSERKREISLAUFES IN DER ZELLSTOFF- UND PAPIER-INDUSTRIE),
A. Akerhagen.
Der Papiermacher, Vol. 28, No. 5, p. 74-76, May 13, 1978. 4 fig, 1 illus.

Descriptors: *Pulp wastes, *Waste water treatment, *Screens, Industrial water, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp and paper industry, Effluents, Water reuse, Recycling, Water conservation, Closed systems.

The Float-Wash system for separating fibers from a stream of water in a pulp or paper mill is based on spraying the water upward through a screen using a full-cone nozzle. The fine fraction passing through the screen forms water column above the screen while the coarse fiber fraction migrates to the periphery of the screen and falls into a container. Float-Wash units are installed in series similarly to cleaners and are mainly employed in cleaning water being recycled for use, e.g., as paper machine shower water. Installations in a tissue mill

and a fiberboard mill are diagrammed. (Speckhard-IPC)
W79-03406

THE CLOSED WATER CIRCUIT OF THE ALZENAU FLUTING BOARD AND PAPER MILL (DER GESCHLOSSENE WASSERKREISLAUF DER WELLAPPEN- UND PAPIERFABRIK ALZENAU),
For primary bibliographic entry see Field 3E.
W79-03407

WATER POLLUTION ABATEMENT IN SIBERIAN PULP AND PAPER MILLS (OCHRANA CISTOTY VOD V SIBIRSKYCH CELULOZARKYCH KOMBINATECH),
Vyskumny Ustav Papiru a Celulozy, Prague (Czechoslovakia).
F. Nemec.
Papir a Celuloza, Vol. 33, No. 5, p. 81-82, 92, 1978. 3 ref, 3 tab.

Descriptors: *Pulp and paper industry, *Water pollution control, *Soviet Union(USSR), Water pollution treatment, Water pollution sources, Wastes, Industrial wastes, Waste treatment, Pulp waste, Water supply, Effluents, Biological treatment, Activated sludge, Coagulation, Chemical oxygen demand, Color, Phenols, Suspended solids, Sludge treatment, Dewatering, Treatment facilities, Flotation, Filtration, Filters, Foreign countries, Aluminum sulfate, Kraft mills, Board mills.

Water supply and effluent treatment systems used in the Baikal and Selenga pulp and paper mills (USSR) are described. The Baikal mill effluent from the production of 200,000, 10,000, and 10,000, and 10,000 tons/year of pulp, fodder yeast, and board, respectively, is treated in a biological treatment plant without a mechanical stage. The activated sludge treatment is followed by chemical-mechanical treatment using alum as a coagulant. The total effluent volume is 12,000 cu m/hr, and the treated effluent has a COD of 2-3 mg/liter (Kubel), a color of 70-80 Pt units, 600 mg/liter of mineral solids, 0.015-0.020 mg/liter of phenols, and 20-30 mg/liter of suspended solids. Excess activated sludge as well as chemical sludge has been stored in Lagoons. A dewatering system is currently under construction for biological sludge, utilizing flotation thickeners and belt filters. A combination of gravity thickeners and pressure filters is being considered for dewatering of the chemical sludge. The Selenga mill produces 240,000 tons/year of kraft pulp and board. The discharge from the mill includes 0.39, 9.8, 0.39, and 49 tons/day of 5-day BOD, COD, suspended solids, and dissolved inorganic materials, respectively. Extensive reconstruction of the mill is planned, including many minor changes that will further reduce the pollution load. (Trubacek-IPC)

W79-03408

BACTERIAL CHARACTERISTICS OF ACTIVATED SLUDGES TREATING CARBOHYDRATE WASTES,
Tokyo Metropolitan Univ. (Japan) Dept. of Biology.

S. Taki.
Water Research Vol. 11, No. 1, p. 85-89, 1977. 25 ref, 5 tab.

Descriptors: *Activated sludge, *Bacteria, *Carbohydrates, *Waste water treatment, Wastes, Industrial wastes, Waste treatment, Water pollution treatment, Water pollution sources, Pulp wastes, Pulp and paper industry, Effluents, Sludge, Microorganisms.

A bacteriological study was conducted on six activated sludge samples from actual plants treating carbohydrate wastes (kraft pulp mill, brewery, yeast culture, confectionery, fruit juice, and soft drink effluents), and the results are compared with the metabolic activities of the sludges and the qualities of the wastes. The sludges tested contain about 100 billion viable bacterial cells/g dry sludge. About 50 strains of bacteria isolated from each sludge sample were classified into groups

according to their morphological and physiological properties. Many isolates could not grow on glucose as the sole carbon and energy source, even if they were isolated from the sludges treating wastes which contained predominantly carbohydrate. Most of the dominant groups of the sludges treating wastes with a low proportion of carbohydrate were Gram-negative rods and were similar to the genera of the sludge grown on sewage reported by other investigators. Their rates of oxygen consumption were higher when they were fed with casamino acids than with glucose. On the other hand, in the sludges treating the wastes with a high proportion of carbohydrate, Gram-positive non-spore-forming bacteria (probably belonging to *Corynebacterium*) and lactic acid bacteria and relatively large coccus predominated. Many strains of these groups had the ability to accumulate reserve polysaccharide and showed a higher oxygen consumption with glucose than with casamino acids or acetate. (Witt-IPC)

W79-03415

EMISSION OF MICROBIAL AEROSOLS FROM POLLUTED WATERS IN DENSELY POPULATED REGIONS,
Kentucky Water Resources Research Inst., Lexington.
For primary bibliographic entry see Field 5A.
W79-03438

REDUCED TOXICITY OF AN AQUEOUS COAL-CONVERSION EFFLUENT FOLLOWING WASTE DISPOSAL TREATMENT,
Tennessee Univ., Oak Ridge. Graduate School of Biomedical Science.
For primary bibliographic entry see Field 5C.
W79-03498

5E. Ultimate Disposal Of Wastes

EVALUATION AND COMPARISON OF OVER-LAND FLOW AND SLOW RATE SYSTEMS TO UPGRADE SECONDARY WASTEWATER LAGOON EFFLUENT,
Utah State Univ., Logan. Coll. of Engineering.
For primary bibliographic entry see Field 5D.
W79-03007

A STUDY OF WASTE GENERATION, TREATMENT AND DISPOSAL IN THE METALS MINING INDUSTRY,
Midwest Research Inst., Kansas City, MO.
For primary bibliographic entry see Field 5D.
W79-03010

A STUDY OF PESTICIDE DISPOSAL IN A SEWAGE SLUDGE INCINERATOR,
Versar, Inc., Springfield, VA.

F. C. Whitmore.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 485, Price codes: A09 in paper copy, A01 in microfiche. Final Report No. SW-116c, 1975. 189 p, 37 tab, 17 ref, 5 append.

Descriptors: *Waste treatment, *Ultimate disposal, *Pesticides, *Incineration, DDE, DDT, Polychlorinated biphenyls, Sewer sludge, Sludge treatment, Incinerators, Toxins, Wastes, Pilot studies, Prototype studies, Municipal wastes, Palo Alto, California, DDD, Water pollution sources.

Pesticides, including DDT and 2,4,5-T, were selected for incineration along with sewer sludge to demonstrate that a modern sewage sludge incinerator could be used in their destruction. The program was conducted in two phases: Phase 1 consisted of prototype experiments performed on the Envirotech Corporation six hearth furnace at Brisbane, California; and Phase 2 consisted of full scale experiments on the Palo Alto, California municipal multiple hearth sewage sludge incinerator. From the six Phase 1 experiments it was concluded that destruction efficiencies for 2,4,5-T were above 99.95% at operating conditions and above 99.99%

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Ultimate Disposal Of Wastes—Group 5E

in many cases with no tetrachlorodioxin detectable; detectable quantities of DDD and DDE were found in the incineration system with no dioxin; the total DDT, DDD, and DDE in all effluent streams did not exceed 0.04% of the feed, and destruction of DDT was 99.96% with the afterburner in operation; variations in feed types, pesticide feed rate, and sludge solids content did not affect the results. The results of full-scale experiments of Phase 2 supported the results in Phase 1. It is concluded that DDT and 2,4,5-T can be safely destroyed by incineration with sewage sludge in a multiple hearth furnace.

W79-03013

COST OF SANITARY LANDFILL DEVELOPMENT AND OPERATION IN ILLINOIS,

Andrews (James Douglas), Springfield, IL.

For primary bibliographic entry see Field 5G.
W79-03014

CONSERVATION OF PETROLEUM WASTES AT RED RIVER ARMY DEPOT,

Red River Army Depot, Texarkana TX. Dept. of Maintenance Effective Engineering.

K. L. Yoast.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A015 030, Price codes: A04 in paper copy, A01 in microfiche. Final Report No. USAMC-ITC-02-08-73-023, March 1974. 62 p, 2 fig, 6 tab, 45 ref.

Descriptors: *Military reservations, *Oil wastes, *Lubricants, *Ultimate disposal, Waste disposal, Oil, Gasoline, Fuels, Solvents, Waste identification, Burning, Economic efficiency, Recycling.

Research was conducted to determine: the main source of waste petroleum oils and lubricants (POL's) at Red River Army Depot (RRAD); suitable methods of minimizing the amount of waste POL's generated by RRAD; and the optimum methods for disposal of the waste POL's. The types of POL's were found to be crankcase drainings, diesel fuel, gasoline, transmission fluid, brake fluid, hydraulic fluid, water, and solvents with the dynamometer shop being a major contributor of waste POL's. Waste POL's are collected in 55 gallon drums and, in the case of the dynamometer shop, in a holding tank in the basement of the shop. Four suggestions for reducing waste POL volume are discussed: reuse fuel from retrograde vehicles received RRAD for fueling depot vehicles; reuse fuel from retrograde vehicles for Code F vehicles; increase oil change interval for most depot equipment; and reuse of oil used in the Depot's Dynamometer Engine Test Shop. Eight methods of disposal of waste POL are described and examined on the basis of economics and compliance with Army, local, State, and Federal regulations. Considering these selection criteria, and quantities, types, and collection of waste at RRAD, it is recommended that the two types of disposal most suitable are combustion for heat recovery (burning) and sale to an entrepreneur. (Gibson-IPA)

W79-03018

STATE-OF-THE-ART SURVEY OF LAND RECLAMATION TECHNOLOGY,

Little (Arthur D.), Inc., Cambridge, MA.

J. B. Berkowitz, J. E. Harrison, P. A. Huska, S. L. Johnson, and P. J. O'Brien.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-038 088, Price codes: A05 in paper copy, A01 in microfiche. Report No EC-CR-76076, May 1976. 99 p, 14 fig, 27 tab, 37 ref. DAAA15-75-C-0188.

Descriptors: *Land reclamation, *Soil contamination, *Path of pollutants, *Pollution abatement, *Soil treatment, Incineration, Degradation, Vegetation, Organic chemical wastes, Waste treatment, Incinerators, Toxicity, Chemical degradation, Soil investigations, Soil management, Economics, Cost analysis, Groundwater, Surface runoff, Plant growth, Revegetation.

Three general approaches for absolute contaminant removal from a land area extending 1/2 square

mile and 25 feet deep are considered in this state-of-the-art study. The adverse environmental effects of contaminated land areas manifest themselves in the following manner: (1) groundwater contamination due to leaching from the land; (2) contamination of surface water due to land run-off; (3) inhibited plant growth; (4) contaminant absorption by vegetation and transfer through the food chain; (5) air pollution from evaporation, sublimation, and wind erosion of contaminated soil; (6) direct contact poisoning; and (7) fire and explosion. The first method, excavation and treatment, utilizes incineration and revegetation and wet chemical processing. In situ treatment involves soil activation, vegetational uptake, inoculation, and fixation. Groundwater treatment methods include up-gradient diversion and down-gradient collection and treatment. These methods are compared regarding technical and economic feasibility. Schematic process flow sheets are provided for rotary kiln soil detoxification, reconstituting soil from incinerated material, chemical soil detoxification, possible sequencing of soil manipulation, and one alternative for groundwater decontamination. (Davison-IPA)

W79-03025

VOLUME REDUCTION SYSTEM FOR SOLID AND LIQUID TRU WASTE FROM THE NUCLEAR FUEL CYCLE: JANUARY - MARCH 1977,

Mound Facility, Miamisburg, OH.

D. F. Luthy and W. H. Bond.

Available from the National Technical Information Service, Springfield, VA 22161 as MLM-2436, Price codes: A02 in paper copy, A01 in microfiche. Report No MLM-2436, July 27, 1977. 9 p, 2 fig, 4 tab, 2 ref. EY-76-C-04-0053.

Descriptors: *Radioactive waste disposal, *Incineration, *Nuclear wastes, Solid wastes, Liquid wastes, Design criteria, Laboratory tests, Waste disposal, Portland cements, Volume reduction, Elements, Metals, Trace elements, Equipment.

A survey of facilities generating radioactive waste and a fuel reprocessor was conducted to develop design criteria for a volume reduction system to treat these combustible solid and liquid wastes. Modifications of the incinerator to permit liquid waste burning are taking place. Glass and cement are being tested in continuing studies of ash immobilization; a proposed ash immobilization facility is illustrated with a flow chart. An extensive survey was conducted in order to locate the only fabricator of drum compactors for compacting empty waste containers according to specifications. (Davison-IPA)

W79-03028

MARITIME ADMINISTRATION CHEMICAL WASTE INCINERATOR SHIP PROJECT.

Maritime Administration, Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 978, Price codes: A17 in paper copy, A01 in microfiche. Final Environmental Impact Statement, Report No MA-EIS-7302-76-041F, 1976. Volume 1 of 2. 369 p, 18 fig, 19 tab, 56 ref, 8 append.

Descriptors: *Waste disposal, *Chemical wastes, *Oceans, *Hazards, *Environmental effects, *Incineration, Ships, Coast Guard regulations, Spills, Continental shelf, Lagoons, Estuaries, Marine biology, Coasts, Ecosystems, Food chain, Design criteria, Intergovernmental Maritime Consultative Organization, Toxicity.

Incineration at sea has been deemed a relatively environmentally safe method for disposal of toxic chemical wastes. The impact of such a disposal method on the ocean environment is examined. The marine environment is regarded as two zones: (1) the coastal ocean which includes estuaries, adjacent wetlands, lagoons, waters over the continental shelves, and the marginal seas; and (2) the open ocean. Consideration is given to the U.S. development of an incinerator vessel; and the design, operation, and equipment of the Dutch ship, VULCANUS, designed to deal with chlorinated hydro-

carbon wastes, is described. The potential hazards involved with the use of such vessels are the accidental release of harmful substances because of mishaps. It is concluded that combustion in the open ocean of toxic chemical wastes has a minimal adverse impact on the marine environment when stringent safety regulations are strictly observed. Combustion efficiencies are above 99.9% in the conversion of chlorinated hydrocarbons to water vapor, carbon dioxide, and hydrogen chloride. The principal concern of accidental spills at sea is the absorption of toxic substances by fish. Safety control measures are detailed and alternative methods are considered. Comments on the Draft Impact Statement requested from various agencies and states are included. (Davison-IPA)

W79-03029

COMPOSTING AT JOHNSON CITY: JOINT USEPA-TVA COMPOSTING PROJECT WITH OPERATIONAL DATA, 1967-1971. VOLUMES I AND II,

Environmental Protection Agency, Washington, DC. Office of Solid Waste.

G. E. Stone, and C. C. Wiles.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-261 047, Price codes: A16 in paper copy, A01 in microfiche. Final Report No EPA/530/SW-31r.2, November 1975. 358 p, 80 fig, 48 tab, 21 ref, 6 append.

Descriptors: *Waste treatment, *Municipal wastes, *Waste disposal, *Composting, Animal wastes, Sewage, Decomposition, Treatment facilities, Degradation, Microbiology, Microorganisms, Equipment, Laboratory tests, Lime, Nitrogen, Phosphorus, Potassium, Organic compounds, Monitoring, Johnson City, Tennessee, Sewage sludge, Cost analysis, Public health.

A joint research and demonstration project in windrow composting of municipal solid wastes and sewer sludge is discussed. The project began in June 1967 and was terminated on June 30, 1971. A total of 33,503 tons averaging 37 tons/day of sewer sludge, cow manure, paunch manure, poultry manure, animal blood, pepper canning wastes, and municipal waste were composted in windrows. Windrow temperatures were maintained at 122°F to 130°F for seven days to destroy the pathogens contained in the refuse. Windrow temperatures at the 1 1/2 ft. level averaged above 140°F for two or three weeks, and it was determined that the compost was safe with regard to potential health problems. The technical feasibility of windrow composting of municipal wastes and sewer sludge was established; the quality of the compost was continually upgraded during the project. Plant construction costs totaled \$960,452; mobile equipment used in plant operations cost \$61,280. Operating costs for 1968 were \$18.45/ton of refuse processed; 1971 operating costs were \$19.70 tons. Cost estimates for various sized plants, based on the study data, are presented. The composts obtained from this plant were lower in phosphorus nitrogen and potassium than commercial inorganic fertilizers but did contain micronutrients required for good plant growth. Favorable responses to compost under field demonstration conditions were from high cash value crop producers and home and garden users. During the project, medical surveillance of the composting plant employees was maintained, and it was determined that no significant abnormalities were found among them. (Davison-IPA)

W79-03032

A RECYCLED-WATER SANITARY WASTE DISPOSAL SYSTEM,

West Virginia Univ., Morgantown.

For primary bibliographic entry see Field 5D.
W79-03034

KINETICS OF WET OXIDATION OF NYLON 66,

Connecticut Univ., Storrs. Dept. of Chemical Engineering.

For primary bibliographic entry see Field 5D.
W79-03125

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5E—Ultimate Disposal Of Wastes

NUTRIENT REMOVAL FROM SECONDARY EFFLUENT,
Nova Scotia Technical Coll., Halifax, Dept. of Bio-Resources Engineering.
For primary bibliographic entry see Field 5D.
W79-03178

A COMPREHENSIVE STUDY OF SUCCESSIONAL PATTERNS OF PLANTS AND ANIMALS AT UPLAND DISPOSAL AREAS.
Coastal Zone Resources Corp., Wilmington, NC.
Final Report, Contract D-77-2, March 1979. 515 p., 45 fig., 101 tab., 163 ref., 3 append. DACW39-74-C-0092.

Descriptors: *Waste disposal, *Dredging, *Biological communities, *Biota, *Habitats, Vegetation, Ecology, Sites, Terrestrial habitats, Biological properties, Ecology, Succession, Vegetation, Biorhythms, Vegetation regrowth, Wildlife.

Five sites were selected for active research to collect biophysical data concerning the ecological succession on upland dredged material substrates. The study was based on one sampling area for each of the following: (1) Mott Island, Connecticut, in the Connecticut River; (2) six disposal islands in Hillsborough Bay, Tampa, Florida; (3) a disposal area associated with Whiskey Bay Pilot Channel in the Atchafalaya River Basin, Louisiana; (4) a disposal area associated with the Gulf Intercoastal Waterway between Port Arthur and Galveston, Texas; and (5) Mott Island in the Columbia River near Astoria, Oregon. On-site analysis of the biota combined with interpretation of available historical photography, disposal history data, and summary knowledge of regional biophysical characteristics were used to hypothesize past, present and future successional changes. All of the areas studied exhibited characteristics of insular habitats, whether or not they were constructed as true islands, or were land disposal sites due to the similar factors affecting the ecological succession. It concluded that careful design of disposal sites, through active stocking, could enhance habitat and biotic diversity, or hasten the succession and self-perpetuation of biotic communities. The potential for habitat management on upland dredged material disposal areas is dependent on recognizing the productive serial stages supported by such factors as soil conditions, climate, flooding, fire, and intermediate-disposal area, for example: islands are good bird breeding habitats, but unsuitable for timber. (Davidson-IPA)
W79-03257

SURVEY OF METHODS USED TO CONTROL WASTES CONTAINING HEXACHLOROBENZENE,

TRW Systems, Inc., Redondo Beach, CA.

S. Quinlivan, M. Ghassemi, and M. Santi.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-253 051, Price codes: A05 in paper copy, A01 in microfiche. Final Report No. EPA/530/SW-120c, November 1976. 95 p., 2 fig., 30 tab., 39 ref., 1 append. 68-01-2956.

Descriptors: *Waste disposal, *Ultimate disposal, *Hexachlorobenzene, *Industrial wastes, *Water pollution sources, Waste treatment, Data collections, Surveys, Solvents, Pesticide residues, Landfills, Deep-well pumping, Ponds, Incineration, Burning, Hazards, Environmental control.

Results of a survey to identify the sources and characteristics of manufacturing wastes containing hexachlorobenzene (HCB), to review and document methods used for treatment and disposal of HCB wastes, and to evaluate the environmental adequacy of the treatment and disposal methods are presented. Based on a literature search and some contact with industry, 14 industries/operations were identified as possible sources of HCB wastes. Of these, chlorinated solvents production and pesticide manufacturing were found to be the two major sources. Methods currently used for the ultimate disposal of HCB include land disposal (sanitary landfill, industrial landfill, deep well injection and drying ponds), incineration (with or

without byproduct recovery), open pit burning, resource recovery, discharge to municipal sewage treatment plants, and emission to the atmosphere, with land disposal being the most prevalent method. Results of an evaluation of the methods indicate that incineration with emission control and byproduct recovery is the most desirable and environmentally acceptable technology for the destruction of HCB wastes. (Gibson-IPA)
W79-03266

JPL ACTIVATED CARBON TREATMENT SYSTEM (ACTS) FOR SEWAGE,
Jet Propulsion Lab., Pasadena, CA.
For primary bibliographic entry see Field 5D.
W79-03268

DESTRUCTION OF POLYCHLORINATED BI-PHENYLS IN SEWAGE SLUDGE DURING INCINERATION,
Versar, Inc., Springfield, VA.

F. C. Whitmore.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 162, Price Codes: A05 in paper copy, A01 in microfiche. Final Report, 1976. 73 p., 22 fig., 16 tab., 11 ref., 1 append. 68-01-1587.

Descriptors: *Incineration, *Sludge disposal, *Polychlorinated biphenyls, *Sewage sludge, Air pollution, Solid wastes, Waste disposal, Aromatic compounds, Chlorine, Gases, Testing, Effluents.

To determine the efficiency with which polychlorinated biphenyls (PCBs) are destroyed in a municipal sewage sludge incinerator, an experiment was conducted in which the sludge input to an incinerator was deliberately doped with a suitable PCB preparation (Aroclor 1254) at a level of 50 ppm (dry weight). Samples were taken of the afterburned gases, the stackgases, scrubber water output and ash (from the bottom hearth) after allowing the furnace to come to equilibrium. Results showed: no PCB in either scrubber water effluent or in the ash; combustion proceeded with great rapidity in the high temperature, water saturated gas stream prior to quenching; less than 6% of the injected PCB's escaped destruction; and very little PCB on the particulate matter either the afterburner breach or in the stack exhaust. (Gibson-IPA)
W79-03269

CONTINUOUS SEWAGE SLUDGE HEAT TREATMENT APPARATUS,

For primary bibliographic entry see Field 5D.
W79-03310

INFLATABLE STRADDLE PACKERS AND ASSOCIATED EQUIPMENT FOR HYDRAULIC FRACTURING AND HYDROLOGIC TESTING,
Geological Survey, Denver, CO. Water Resources Div.

For primary bibliographic entry see Field 7B.
W79-03342

NEARSHORE DISPOSAL: ONSHORE SEDIMENT TRANSPORT,

Coastal Engineering Research Center, Fort Belvoir, VA.

For primary bibliographic entry see Field 5B.
W79-03382

PROCESS FOR TREATING MATERIALS SUCH AS COMBUSTIBLE SLUDGES IN A FLUIDIZED-BED REACTOR (PROCEDE DE TRAITEMENT DE MATIERES, TELLES QUE NOTAMMENT DES BOUES COMBUSTIBLES, DANS UN REACTEUR A LIT FLUIDISE).
Ahlstrom (A.) Osakeyhtio, Helsinki (Finland).

French Patent No. 2,363,754. April 21, 1978. 27 p., 6 fig., 1 tab., 16 claims.

Descriptors: *Pulp wastes, *Sludge treatment, *Burning, *Patents, Wastes, Industrial wastes, Water pollution treatment, Water pollution

sources, Pulp and paper industry, Sludge, Solid wastes, Waste disposal, Water pollution control.

A process for combustion of sludges (particularly mechanically dewatered pulp-mill and paper-mill sludges) in a fluidized bed is characterized by the removal of hot particles from the reactor flue gases and use of at least part of these particles in preheating and partially drying the sludge prior to introduction into the reactor. (Speckhard-IPC)
W79-03395

USE OF 'BIOPOND SLUDGE' AS A FEED INGREDIENT FOR PEN-REARED COHO SALMON,

Weyerhaeuser Co., Seattle, WA.

For primary bibliographic entry see Field 5G.
W79-03474

5F. Water Treatment and Quality Alteration

MIUS TECHNOLOGY EVALUATION - WATER SUPPLY AND TREATMENT,
Oak Ridge National Lab., TN.

A. L. Compre, W. L. Griffith, W. J. Boegly, Jr., I. Spiewak, and D. G. Thomas.

Available from the National Technical Information Service, Springfield, VA 22161 as ORNL-HUD-MIUS-21, Price codes: A07 in paper copy, A01 in microfiche. Report No. ORNL-HUD/MIUS-21, April 1976. 144 p., 29 fig., 36 tab., 118 ref., 1 append. W7405-eng-26.

Descriptors: *Modular Integrated Utility System Program, *Water supply development, Water treatment, *Technology, Utilities, Water works, Water quality, Potable water, Water quality, Groundwater, Surface water, Coagulation, Desalination, Disinfection, Filtration, Flocculation, Costs, Separation techniques.

Methods and processes which could be used in the Modular Integrated Utility System (MIUS) Program for the treatment of potable water are evaluated. Treatment required to provide potable water varies with the quality of the water supply. Water quality and treatment processes appropriate for ground and surface waters are examined. Groundwaters usually require less treatment, and many supplies may need only disinfection and/or softening; costs of providing potable water from ground supplies are considerably lower than those of providing water from other sources. The technology discussed is largely appropriate to the treatment of surface water supplies. Many surface water supplies can be suitably treated through the use of small, commercially available pre-engineered water treatment plants, but a separate evaluation of the treatment appropriate for each MIUS site is recommended. Costs for these plants are similar to extrapolated capital costs of conventional treatment plants; it is indicated that cost/unit size increases as plant capacity decreases. A treatment system for MIUS potable water may include disinfection, coagulation and flocculation, solids separation, and filtration. The provision of additional labor may be necessary for compliance with regulatory agency standards; automation will reduce onsite labor. Technology, available for the treatment of brackish water supplies, provides high quality potable water. Provision of fire protection water should be considered in an economic evaluation, because it represents a large portion of the water treatment plant and carriage costs for a MIUS. (Davidson-IPA)
W79-03016

ENERGY REQUIREMENTS FOR WATER TREATMENT SYSTEMS,

Ontario Ministry of the Environment, Toronto. Applied Sciences Section; and Ontario Ministry of the Environment, Toronto. Pollution Control Branch.

G. D. Zarnett.
Research Paper No. S2043, November 1976. 15 p., 1 fig., 1 tab., 8 ref.

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Descriptors: *Energy equation, *Water treatment, *Systems, Water pumping, Velocity, Flow friction, Aeration, Coagulation, Flocculation, Sedimentation, Filters, Head loss, Mass transfer, Chemical oxidation, Disinfection, Energy.

Data compiled from literature concerning the energy requirements of water treatment equipment is tabulated according to operation and process. These operations include: aeration, coagulation and flocculation, mixing and sedimentation, thickeners and clarifiers, filters, mass transfer operations, chemical oxidation and disinfection, other chemicals-energy required for production, and lights and miscellaneous power. It is suggested that this data be used comparatively, and in conjunction with the mechanical energy equation. (Davidson-IPA)
W79-03021

OZONIZATION OF WATER CONTAINING HUMIC COMPOUNDS, PHENOLS, AND PESTICIDES (OZONIROVANIYE VODY, SODERZHASHCHEY GUMINOVYE SOYEDINENIYA, FENOLY I PESTITSIDY).

For primary bibliographic entry see Field 5D.
W79-03027

FEDERAL GUIDELINES: PRETREATMENT OF POLLUTANTS INTRODUCED INTO PUBLICLY OWNED TREATMENT WORKS.
Environmental Protection Agency, Washington, DC. Office of Water Program Operations.
For primary bibliographic entry see Field 5D.
W79-03250

SCHOOL WATER SUPPLY FLUORIDATION,
Environmental Protection Agency, Washington, DC. Office of Water Supply.

E. Bellack.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 962, Price Codes: A02 in paper copy, A01 in microfiche. 1972, 21 p, 5 fig, 22 ref.

Descriptors: *Water treatment, *Fluoridation, *School(Education), Engineering, Equipment, Public health, Flow control, Water control, Flow meters, Water measurement, Pipelines, Installation, Maintenance.

A simplified procedure for fluorinating a school water supply is presented. School and community water fluoridation systems have basically similar engineering aspects, except that fluoridation is maintained at a higher level for a school system. The equipment, which varies depending on the size of the water system and its complexities, consists of a solution container, a solution feeder and a water meter. Procedures for selecting the school site installation are set forth; surveillance, maintenance and trouble-shooting are discussed. It is concluded that the varying conditions at individual sites may require further engineering consultation. (Davidson-IPA)
W79-03260

PRELIMINARY LISTING OF MUNICIPAL WATER SUPPLY CAPACITIES,
Oklahoma Foundation for Research and Development Utilization, Inc., Edmond.

For primary bibliographic entry see Field 3D.
W79-03261

FREEZE DESALINATION AND CONCENTRATION APPARATUS,

For primary bibliographic entry see Field 3A.
W79-03312

NOZZLE FOR ROTARY FILTER PIPE,
F. E. Stuart, Sr.

U.S. Patent No. 4,113,183, 4 p, 5 fig, 8 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 793-794, September 12, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Filtration, Filters, Equipment, Nozzles, Turbulent flow, Backwashing, Sand filters.

In sand type filters, a pipe is placed beneath the surface of the sand bed and is rotatable on a vertical axis, located in the middle of the length of the pipe. It has nozzles extending along the trailing side of the pipe on each side of the axis of rotation. When these nozzles are supplied with fluid under pressure they cause the pipe to rotate and the water from the nozzles will agitate the filter and wash it. A nozzle for this purpose is illustrated in U.S. Pat. No. 3,351,292 and the present invention represents an improvement by providing additional passages for fluid from the nozzle which not only assist in impelling the pipe in its rotary action but also provide for increased agitation of the filter bed. (Sinha - OEIS)
W79-03315

METHOD OF IMPROVING THE BACKWASHING OF FIXED BEDS FORMED OF GRANULAR MATERIALS,

Sulzer Bros. Ltd., Winterthur (Switzerland). (Assignee).

For primary bibliographic entry see Field 5D.
W79-03316

PROCESS FOR TREATING DRINKING WATER AND SEWAGE,

H. Corte, H. Heller, M. Lange, and O. Netz. U.S. Patent No. 4,115,261, 4 p, 1 tab, 5 ref; Official Gazette of the United States Patent Office, Vol 974, no 3, p 1486, September 19, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Waste water treatment, Water pollution treatment, Organoleptic properties, *Odor, *Taste, Adsorption, *Resins, *Polymers, Organoleptic properties.

A process removes oleophilic odor- and taste-producing substances from water by treating the water with an insoluble, macroporous adsorber resin comprising a matrix based on a cross-linked organic polymer containing aromatic nuclei. The polymer contains chloromethyl groups as substituents and some of the chlorine atoms in the chloromethyl groups can be reacted with ammonia or amines. Furthermore the invention relates to the adsorber resins to be used in the claimed process. (Sinha - OEIS)
W79-03323

WATER PURIFICATION METHODS,
International Telephone and Telegraph Corp., Nutley, NJ. (Assignee).

E. W. Sawyer, Jr. U.S. Patent No. 4,116,826, 9 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 4, p 2028, September 26, 1978.

Descriptors: *Patents, *Water treatment, *Water purification, Water quality control, Adsorption, *Clays, Toxins, Heavy metals, Pesticides, Viruses, Hormones, Attapulgite clay, Regeneration.

Various grades of attapulgite clay and sepiolite are used to treat water using contacting or percolation techniques to remove substances not removable by standard water purification methods under many conditions. Substances such as pesticides, toxins, hormones, heavy metal cations and viruses are removed from water by adsorption upon the clay surface. When contacting is employed, the clay containing the adsorbed substances is subsequently removed by sedimentation or filtration. The clays can be regenerated by appropriate chemical or thermal techniques. (Sinha - OEIS)
W79-03331

STUDIES ON THE USE OF COAGULATION AIDS FOR TREATMENT OF BOILER FEED-WATER (CERCETARI PRIVIND UTILIZAREA ACCELERATORILOR DE COAGULARELA

TRATAREA APELOR DE ALIMENTARE A CANELOR,
For primary bibliographic entry see Field 5F.
W79-03393

5G. Water Quality Control

AN ASSESSMENT OF THE EFFECTS OF STORMWATER RUNOFF FROM URBAN WATERSHEDS ON THE WATER QUALITY OF A RECEIVING RESERVOIR,
Tennessee Univ., Knoxville.

For primary bibliographic entry see Field 5C.
W79-03005

SIGNIFICANCE OF TURBIDITY FOR QUALITY ASSESSMENT OF AGRICULTURAL RUNOFF AND IRRIGATION RETURN FLOW,
Washington State Univ., Pullman. Dept. of Agricultural Engineering.

For primary bibliographic entry see Field 5A.

W79-03006

MUNICIPAL SLUDGE MANAGEMENT: EPA CONSTRUCTION GRANTS PROGRAM, AN OVERVIEW OF THE SLUDGE MANAGEMENT SITUATION,

Environmental Protection Agency, Washington, DC. Municipal Construction Div.

For primary bibliographic entry see Field 5D.
W79-03011

COST OF SANITARY LANDFILL DEVELOPMENT AND OPERATION IN ILLINOIS,
Andrews (James Douglas), Springfield, IL.

J. D. Andrews.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-265 546, Price codes: A06 in paper copy, A01 in microfiche. Final Report No. IIEQ 76-15, July 1976. 116 p, 10 fig, 13 tab, 42 ref. 40.024.

Descriptors: *Landfills, *Costs, *Cost analysis, Operating costs, Maintenance costs, Waste treatment, Solid wastes, Surveys, Sites, Project planning, Equipment, Illinois, Cost comparisons, Waste disposal.

A study of private and public owned sanitary landfills accepting residential refuse and serving communities in Illinois is reported. Forty-five sites were selected for interviews on the size of operation, type of ownership and operation, and location within the state. Surveys were conducted at 23 sites representing about 10% of the total number of residential refuse sanitary landfills in Illinois. A literature review of sanitary landfill practices and costs, conducted for the period 1970 to 1975, provided a basis for comparison with current developmental, operational and closing costs. Landfill development is presented, and includes: planning an engineering, site development, site operation, and site closing and maintenance. Sanitary landfill sites were classed into five categories according to their size and the amount of refuse processed per week. Summaries of cost data are presented according to these categories. (Davidson-IPA)
W79-03014

MIUS TECHNOLOGY EVALUATION — WATER SUPPLY AND TREATMENT,
Oak Ridge National Lab., TN.

For primary bibliographic entry see Field 5F.

W79-03016

EVALUATION OF POLLUTION CONTROL IN FOSSIL FUEL CONVERSION PROCESSES: GASIFICATION: SECTION 5. BI-GAS PROCESSES,

Exxon Research and Engineering Co., Linden, NJ. C. E. Jahnig.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-243 694, Price codes: A04 in paper copy, A01 in microfiche.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

Final Report No. EPA-650-2-74-009-g, May 1975.
73 p, 3 fig, 16 tab, 38 ref. 68-02-0629.

Descriptors: *Coals, *Air pollution, *Coal gasification, *Environmental effects, Water pollution, Air pollution control, Wastes, Pollution abatement, Trace elements, Effluents, Liquid wastes, Solid wastes, Sulfur, Fossil fuels, Gases.

Results of a study to evaluate environmental aspects of the BI-GAS coal gasification process are presented. Modifications were made to the commercial plant projections developed by Air Products and Chemicals, Inc., which was used as the basis for the study. The plant design includes shift conversion and methanation to produce a gas with a heating value of 943 Btu/cu ft, available at 1,075 psia. The plant, sized to make 250 million SCFD of pipeline gas, uses Western Kentucky coal. The coal is cleaned and washed, and 14,535 tons/day provide all the fuel for drying and utilities production and the gasification requirements. Effluents to the air and liquid and solid effluents generated by the process are examined. Preparation of the raw gas so that it can be methanated to higher Btu pipeline gas is described. Although the trace elements contained in coal are less than 1% concentration, their potential environmental impact is considered. Alternatives to improve the thermal efficiency of the process include: the addition of facilities to control sulfur emission on furnaces firing high sulfur coal; flue gas clean-up; dust recovery; and general efficiency items to conserve fuel. Areas requiring further study are discussed. (Davison-IPA)

W79-03019

GUIDE TO CRITERIA FOR LABORATORY EVALUATION OF BACKFLOW PREVENTION DEVICES FOR PROTECTION OF POTABLE WATER SUPPLIES,

National Engineering Lab. (NBS), Washington, DC. Center for Building Technology.

G. C. Sherlin, R. R. Beausoleil, and L. S. Galowin.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 303, Price codes: A07 in paper copy, A01 in microfiche. Final Report No NBSIR 76-1020, March 1976. 44 p, 2 fig, 4 tab, 14 ref, 1 append. 462,4190. EPA-LAG-0170(D)A.

Descriptors: *Materials testing, *Water quality control, *Potable water, Fluid mechanics, Laboratory tests, Field tests, Valves, High pressure valves, Design criteria, Performance, Specifications, Reliability, Equipment, Plumbing, Water supply.

Detailed requirements, criteria and test procedures for rating reduced pressure principle back pressure backflow preventers are outlined. This type of device consists of two independently acting check valves, internally forced loaded to a normally closed position, and separated by a chamber with an automatic relief for venting to the atmosphere, which is internally forced loaded to a normally open position. They operate under continuous pressure. Details are given on criteria for: size, working pressure, flow capacity, structural strength, mechanical function, misassembling, evidence of failure at barriers, location of test cocks, debris collection at relief valve opening, leakage, repairability, release of trapped air, corrosion resistance, and durability. Laboratory testing includes hydrostatic tests of the complete housing and the outlet. Field tests include operation of differential relief valve, testing check valves No. 1 and No. 2. Instructions for marking and installation are given and terms are defined. A leakage test developed at Oak Ridge National Laboratory is discussed. (Davison-IPA)

W79-03022

EFFECTS OF MOSQUITO CONTROL DITCHING ON JUNCUS MARSHES AND UTILIZATION OF MOSQUITO CONTROL DITCHES BY ESTUARINE FISHES AND INVERTEBRATES,

North Carolina Univ. at Chapel Hill. Inst. of Marine Sciences.

H. L. Marshall. PhD Dissertation, 1976. 197 p.

Descriptors: *Salt marshes, *Ditches, *Marsh plants, Wetlands, Marshes, Tidal marshes, Aquatic animals, Aquatic habitat, Fish, Aquatic invertebrates, Spoil banks, Vegetation establishment, *North Carolina.

Large areas of irregularly flooded North Carolina salt marsh dominated by *Juncus roemerianus* have been ditched in an attempt to control mosquito breeding. Ditching increased the area of available aquatic habitat in the marshes by a factor of about five, but spoil piles now occupy 10-13% of the ditched marsh. The ditches were inhabited by numbers of juvenile fishes, crabs, and shrimps, especially during late winter, spring, and early summer. The ditches increase the amount of nursery area available for fishes and invertebrates including some of commercial and sports interest. Except for the direct effects of the spoil which was piled on top of the marsh during ditching, no large changes were evident in the density and growth of adjacent *Juncus*. Bushy vegetation, especially *Buccharis* and *Iva*, had invaded many of the spoil piles and in some cases had grown up along the ditches. Many spoil piles were not covered significantly by vegetation even after eight years. Erosion of spoil piles continues to form water-retaining levees along ditches. (Steiner-Mass)

W79-03023

FACTORS UTILIZED IN THERMAL POWER PLANT SITTING: A REVIEW THROUGH THE MID-19702,

Clemson Univ., SC. Dept. of Environmental Systems Engineering.

B. C. Dysart, III, and A. Kellizy.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 700, Price codes: A03 in paper copy, A01 in microfiche. Water Resources Research Institute. Clemson University, Report No 72, April 1978. 31 p, 10 tab, 49 ref. OWRT B-049-SC(2).

Descriptors: *Thermal powerplants, *Site selection, *Thermal pollution, Environmental effects, *Sites, Reviews, Costs, Available water.

Described is the evolution of siting factors and criteria for locating thermal electric power generating stations. Until the early 1960s, such factors were generally limited to land costs, site preparation costs, delivered fuel costs, transmission costs to the load center, and availability of the cooling water needed. The advent of nuclear power plants led to other important considerations in screening and finally selecting a thermal power plant site. Included were geological analysis for fault-free foundations, hydrologic analysis to reveal the consequences of accidental radiological emissions to surrounding waters, and meteorological analysis to discover the possible fate of emissions to the air. With the 1970s, the siting process became increasingly involved with a variety of environmental, political, institutional, and social factors in addition to added technical and economic factors. The anticipated trend for the future, as of 1973, was determined based on interviews with utility, industry trade association, consulting firm, and regulatory agency personnel.

W79-03035

EVALUATION OF ALTERNATIVE STORM-WATER MANAGEMENT POLICIES,

Maryland Univ., College Park. Dept. of Civil Engineering.

For primary bibliographic entry see Field 6B.

W79-03039

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,

Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.

R. W. Fuessle, R. M. Lyon, E. D. Brill, Jr., G. E. Stout, and K. E. Wojnarowski.

Journal of the Water Resources Planning and Management Division, American Society of Civil Engi-

niers, Vol 104, No WR1, Proceedings Paper 14183, p 193-209, November 1978. 3 fig, 8 tab, 35 ref. EPA R-804821.

Descriptors: *Ohio River, *Cooling towers, *Thermal powerplants, *Water loss, *Low flow, Irrigation, Municipal water, Industrial water, Planning, Environmental effects, Water quality, Water supply, Energy, Coal-gasification plant.

Widespread adoption of evaporative cooling towers will significantly increase water consumption by power plants over the coming decades. The analysis presented includes consideration of allocation issues associated with growing competitive uses: (1) municipal; (2) industrial; (3) irrigation; and (4) in stream uses. Given hypothetical plant siting strategies suggested by the initial work of the Ohio River Basin Energy Study, consumption will represent high percentages of flows in the tributary basins of the lower Ohio River Basin, especially during 7-day, 10-year low-flow conditions. Consumption levels were shown for tributary river basins in Illinois, Indiana, Kentucky, and Ohio. Alternatives to high levels of consumption were suggested. In addition to presenting an analysis of water allocation in the Ohio Basin, a useful framework for analyzing water allocation in other regions was suggested. (Singh-ISWS)

W79-03057

SOIL EROSION CONTROL ON CONSTRUCTION SITES WITH PORTLAND CEMENT,

Science and Education Administration, Oxford, MS. Sedimentation Lab.

For primary bibliographic entry see Field 4D.

W79-03058

ECONOMIC DEMAND FOR WATER AND ECONOMIC COSTS OF POLLUTION CONTROL,

Houston Univ., TX.

R. G. Thompson.

In: Proceedings of a Workshop on Modelling of Water Demands, 17-21 January 1977, Laxenburg, Austria. J. Kindler, Ed., International Institute for Applied Systems Analysis, CP-78-6, Laxenburg, Austria, June 1978, p 19-36. 12 fig, 1 tab, 3 ref.

Descriptors: *Water demand, *Water pollution control, *Water policy, *Evaluation, *Economics, Energy, Fuels, Prices, Withdrawal, Agriculture, Industrial model, Incremental costs, Systems analysis.

Increasing scarcity of water resources requires a reassessment of past trends in water use and an evaluation of water use. Evaluating the economic, resource, and technology consequences of different water policies requires a synthesis of relevant technical information into a comprehensive economic framework. This framework is needed to evaluate how the economic demands for water and the economic costs of pollution control will be affected by different water conservation and environmental enhancement policies. Also, this framework is needed to evaluate the interactive effects of a wide range of policies on the economic demands for water, the economic costs of pollution control, the economic demands for energy, and the economic demands for resource recovery. (Bell-Correll)

W79-03085

PLANNING IN SMALL- AND MEDIUM-SIZE ILLINOIS MUNICIPAL WATER SYSTEMS,

Illinois Univ. at Urbana-Champaign.

For primary bibliographic entry see Field 3D.

W79-03097

A COMMUNITY SURVEYS ITS SANITATION PROBLEMS,

Bowling Green State Univ., OH. Dept. of Sociology.

J. E. Kivlin, F. C. Fliegel, and N. Sharma.

Small Town, Vol. 6, No. 12 p. 7-10, June 1976, 3 tab, 17 ref.

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Descriptors: Economics, *Surveys, Public health, *Illinois, *Sanitation, *Water pollution control, Affirmative action.

Based on self-administered questionnaires given to 225 voting age adults in a town of about 2700 residents, this paper concludes that information campaigns which attempt to move people into affirmative action on water pollution control issues would be successful in small communities. The data revealed that favorable pollution control attitudes in small communities correlated positively with information gained through oral and written communications. The data also indicated a relative absence of demographic relationships in responses. Thus, concern for pollution control appears to be widely distributed; 'blue-collar workers' relatively low educational and occupational prestige levels are not likely to represent major obstacles to the success of small community pollution control campaigns. Overcoming perceived self-interest, according to questionnaire analysis, should perhaps be the main concern of pollution control campaigns. Contradictory positions by surveyed individuals on a local pollution problem and what to do about it could often be attributed to 'subjective bias'; opinions and behavior oriented towards enhancement of self. Campaigns which plan against this bias in their strategies, suggests the study should prove successful.

W79-03098

ILLINOIS NATURAL HISTORY SURVEY REPORTS OF CLAMS AND DUCKS, Illinois Natural History Survey, Urbana. For primary bibliographic entry see Field 7C. W79-03100

BACTERIAL ECOLOGY OF STRIP MINE AREAS AND ITS RELATIONSHIP TO THE PRODUCTION OF ACIDIC MINE DRAINAGE, Ohio State Univ., Columbus. Dept. of Microbiology.

F. R. Dugan.
The Ohio Journal of Science, Vol. 75, No. 6, p. 266-279, November 1975. 12 fig. 1 tab, 50 ref. OWRT A-001-OHIO(2).

Descriptors: *Acid mine water, *Acid bacteria, *Strip mines, Sulfuric acid, Pyrite, *Sulfate reducing bacteria, *Mine drainage, *Bacteria, Water pollution, *Acidophilic bacteria, Coal mine refuse.

The activity of acidophilic bacteria as agents involved in the production of sulfuric acid from iron pyrite (FeS_2) found in association with coal mine refuse or spoils was reviewed. Data were presented which demonstrated the inhibitory effect of anionic detergents and certain organic acids on the growth and metabolism of the acidophilic thiobacilli. The influence of acidic mine drainage on the microflora of non-acid polluted streams was considered. Also discussed were the heterotrophic microbes which are indigenous to acid (pH 3.0) streams and acid coal refuse, with a section devoted to the potential for sulfate reducing bacteria as agents for removal of sulfuric acid from the streams. (Ohio-Ohio).
W79-03104

OPTIMAL PLANNING FOR URBAN STORM DRAINAGE SYSTEMS, Purdue Univ., Lafayette, IN. School of Civil Engineering. For primary bibliographic entry see Field 6A. W79-03107

PLANNING STORM-DRAINAGE SYSTEMS FOR URBAN GROWTH, Purdue Univ., Lafayette, IN. School of Civil Engineering. For primary bibliographic entry see Field 6A. W79-03108

STATE LAWS AND INSTREAM FLOWS, Western Natural Resources Foundation, Salt Lake City, UT.

For primary bibliographic entry see Field 6E. W79-03120

DEVELOPING A STATEWIDE WATER INFORMATION SYSTEM FOR MINNESOTA, Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.

For primary bibliographic entry see Field 6D. W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESOTA,

Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.

For primary bibliographic entry see Field 6D. W79-03122

THE IMPACT OF ENVIRONMENTAL LEGISLATION ON ECONOMIC DEVELOPMENT IN APPALACHIAN NEW YORK.

New York State Dept. of Environmental Conservation, Albany. Office of Program Development and Planning.

For primary bibliographic entry see Field 6G. W79-03145

RESIDUALS MANAGEMENT PRIORITIES FOR THE MONONGAHELA RIVER BASIN.

Resource Planning Associates, Inc., Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-273 900, Price codes: A09 in paper copy, A01 in microfiche. Prepared for Appalachian Regional Commission, Washington, D.C., Final Report, July 1976. 27 tab, 18 append. 76-28 CO-4410-751-302-0624.

Descriptors: *Water quality, *Air pollution, *Water pollution, *Air quality, *Model studies, *Appalachia, *Monongahela River Basin, *Environmental quality, *Residuals management, *Resources management, *Residuals Management Priority Model, Natural resources, Public investments, Cost-benefit analysis, Population, Environmental effects, River basins, Land subsidence, Solid wastes, Public health, Strip mining, Data inventory.

The purpose of this report is to adapt the Residuals Management Priority Model (RMPM) to the needs of the Appalachian Regional Commission and to the specific characteristics of the Monongahela River Basin. The model identifies pollutants or residuals associated with processes/sources; and receptors or elements that are affected by the pollutants. Then, to calculate damages in a given geographical area, the level of pollution in the area and levels of the presence or density of the receptors in the area are measured. These damages are ranked according to the following value systems: impact on long-term quality of natural resources; impact on health hazards caused by population; impact on economic costs of pollution in the basin from the view point of the nation and of the region; and impact on damages from the viewpoint of the individual. Damages associated with 20 pollutants in the Basin were evaluated for these value systems. The pollutants that cause the greatest damage in all value systems are strip mining, acidity/alkalinity, solid waste, coliform, sulfur oxides, and pH. The least damage is caused by subsidence, hydrocarbons, dissolved oxygen, and thermal pollution. Details of the methodology, findings and recommendations are listed in the report. The information is supplemented by appendices that document the data base used, that list major data entries and references, and that present a glossary of key technical terms employed in the study. This report is intended as a summary of results from Phase I of the study. Phase II of the model will consist of a cost/benefit analysis of alternative pollution abatement strategies. (Coan-NC)

W79-03146

WATER AND SEWER FUNDING PROGRAMS AT FMHA, EDA, AND HUD: A SURVEY OF ENVIRONMENTAL IMPLICATIONS, National Wildlife Federation, Washington, DC. Resources Defense Div. P. Slesinger.

Prepared for Council on Environmental Quality, Washington, D.C., March 1, 1977. 53 p.

Descriptors: *Water quality, *Water supply, *Interceptor sewers, *Government finance, *Farmer's Home Administration, *Economic Development Administration, *U.S. Dept. of Housing and Urban Development, *Funding programs, Water supply development, Public utilities, Water distribution, Community development, Water management(Administrative) Planning, Federal government, Government supports, Environmental effects, Public works, Environmental impact statements, Growth.

This report determines whether the public works programs of certain federal agencies induce sprawl and adverse environmental changes. The programs of the Farmer's Home Administration (FmHA), the Dept. of Housing and Urban Development (HUD), and the Economic Development Administration (EDA) are examined in relation to the construction and expansion of water supply and sanitary sewer systems, particularly interceptor sewers and water transmission lines. The various programs of each agency are briefly summarized, described in terms of awards and loan obligations, assessed terms of funding patterns, and analyzed as to the adequacy of each agency's NEPA regulations with respect to the CEQ guidelines and other non-NEPA environmental regulations. To the extent possible, the report assesses the quality of environmental review by the agencies and the impact of their projects on the environment. Data were collected from each agency's annual fiscal report, agency regulations, agency field instructions and environmental impact statements, and interviews. Conclusions and recommendations for each agency are provided. Indications are that of the three agencies, EDA is doing the best job. Both FmHA and HUD programs are creating adverse environmental impacts. The main conclusion is that the sewer and water programs of EDA, FmHA and HUD should be administered by one agency. (Coan-NC)
W79-03147

SPILL RISK ANALYSIS PROGRAM: METHODOLOGY DEVELOPMENT AND DEMONSTRATION, FINAL REPORT, ORI, INC., Silver Spring, MD.

L. A. Stoehr, C. H. Morgan, F. J. Reiffel, and P. M. Tullier.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 954, Price codes: A13 in paper copy, A01 in microfiche. Sponsored by Department of Transportation, U.S. Coast Guard Headquarters, Office of Research and Development, Report No. CG-D-21-77, April 1977, 299 p, 45 fig, 20 tab, Vol I of II. DOT-CG-31571-A.

Descriptors: *Accidents, *Simulation, *Spills, *Model studies, Pollution, Safety, Decision making, Planning, Dynamic programming, Regulation, *Casualty analysis, *Spill-risk analysis, *Marine safety, *Collision avoidance, Casualty reduction.

This report presents research and results in the development and demonstration of scientific methods for measuring the effectiveness of merchant marine safety programs. It provides methods of quantitatively measuring change in marine accident probability associated with specific rules and regulations. Two methods for evaluating these safety programs were employed: (1) the Quasi-Experimental Method for analysis of casualty records to assess the potential effectiveness of safety measures and to clarify the sources of collision causes; and (2) the Scenario Model for exploring ship collision risk and avoidance capabilities. When formulating the QEM, there were several underlying assumptions: both vessels are operated in a safe and prudent manner; both vessels on a potential

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

collision course detect each other ahead of coming close in proximity; a passing strategy is assumed; and both make necessary maneuvers to achieve a safe passing. Based on these assumptions, collision-event sequence diagrams and safety analysis logic trees (SALT) were produced. The programs analyzed using the QEM were: bridge-to-bridge radiotelephone effectiveness; collision-avoidance radar system effectiveness; and collision causes. Human factors were cited as the most important area when reducing collision risks. The scenario model is a dynamic computer simulation of the two-ship collision situation. It expresses a mathematical relationship among diverse factors that permits some measurement of alternatives. The major conclusion was that if the speed of the erring vessel is decreased by half, 80% of the collisions in the meeting scenario could be avoided and all collisions in the overtaking scenario could be avoided. (Coan-NC)

W79-03148

ACCOMPLISHMENT PLAN, REGION VIII, UTAH LAKE-JORDAN RIVER BASIN.

Environmental Protection Agency, Denver, CO. Region VIII.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 281, Price codes: A05 in paper copy, A01 in microfiche. December 1972. 97 p.

Descriptors: *Water quality, *Water resources development, *Water pollution, *Waste water treatment, *Utah Lake(UT), *Jordan River Basin(UT), Sewage treatment, Sludge, Industrial wastes, Residential wastes, Biochemical oxygen demand, Coliform, Dissolved oxygen, Total suspended solids, Utah, Regional planning.

The Utah Lake-Jordan River Basin encompasses the headwaters to the Great Salt Lake including all of Salt Lake and Utah Counties. The accomplishment plan covers 940 stream miles and 150 square miles of surface water. Pollution problems arise from recreational/second home developments and from major industrial dischargers like U.S. Steel. Present waste water treatment efficiency does not meet state effluent standards and generally violates instream standards. The report discusses pollutant loadings, water quality standards, and tactical solutions to pollutant problems so that water quality of the Utah Lake-Jordan River Basin can meet instream 'C' standards by June 30, 1976. Tables of basin load summaries are presented showing fifth day BOD and coliform levels, proposed decreases of these levels over fiscal years '73-'76, water quality objectives, and the year in which the minimum acceptable water quality levels are to be achieved. A chronological ordering of planned accomplishments is shown outlining specific steps EPA officials should take to insure adequate water quality in the region. Principal point source loads and locations are listed along with the type and amount of pollutant each source discharges. Tactical solutions are offered based on particular situations and problems with a timetable and manpower schedule for instituting the proposed solutions. The report finishes by listing each discharger and the schedule for pollution reduction levels required by each to meet ambient water quality standards by FY '76. (Coan-NC)

W79-03149

ENVIRONMENTAL RESOURCES MANAGEMENT STUDIES OF THE KISSIMMEE RIVER BASIN,

Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.

W. C. Huber, J. P. Heaney, P. B. Bidient, and J. P. Bowden.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-269 330, Price codes: A13 in paper copy, A01 in microfiche. Prepared for Central and Southern Florida Flood Control District, West Palm Beach, Final Report, May 1976. 296 p, 74 tab, 91 fig, 2 append.

Descriptors: *Water quality, *Water resources management, *Land use, *Florida, *Kissimmee River Basin(FL), *Environmental management,

Land classification, Soil types, Agriculture, Soil moisture, Equitable apportionment, Drainage density, Hydrology, Agricultural runoff, Drawdown, Lakes, Swamps, Marshes, Water retention, Linear programming, Model studies.

The Kissimmee River Basin, located in the central portion of peninsular Florida between the Peace River Basin to the west and the St. Johns River Basin to the east, originates near Orlando, passes through a series of shallow lakes in its upper reaches, emerges as a channelized river south of Lake Kissimmee, and flows south into Lake Okeechobee. The report describes the transition of the Kissimmee River Basin from a status typified by natural vegetation with low intensity agriculture to one increasingly characterized by intensive agriculture and urbanization, with associated water quantity and quality problems. Management alternatives are considered in three phases: land use analysis, hydrologic and water quality analysis, and analysis of storage/treatment capabilities of natural systems. Land use changes are measured using a linear programming method which appritions land among different uses and over different soil types on basis of agricultural demands, costs and constraints; this method allows the researcher to project future land use patterns. Indices of environmental quality are measured by hydrologic and water quality responses in the river basin. Hydrologic analysis for the lower basin is performed by generating surface and subsurface runoff in the model HLAND, coupled to a Muskingum routing model for the Kissimmee River. Estimates of historical and projected quantity and quality of runoff from different land uses are offered. The relationship between drainage density and the quantity and quality of runoff is also explored. Management for environmental quality in the last management phase—analysis of storage/treatment capabilities of the natural systems—focuses on maintaining high proportions of subsurface flow, high detention times, and upon utilization of natural marshes and swamps for water quantity and quality control. (Coan-NC)

W79-03150

NEW ENGLAND REGION SUMMARY REPORT: SEVERE RESOURCE PROBLEMS AND RECOMMENDATIONS FOR THEIR RESOLUTION—1975 ASSESSMENT OF WATER AND RELATED LAND RESOURCES.

New England River Basins Commission, Boston, MA.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-275 342, Price codes: A13 in paper copy, A01 in microfiche. Prepared for U.S. Water Resources Council, Washington, D.C., Technical memorandum 4, NER BC-77, November 1977. 309 p, 7 fig, 2 append.

Descriptors: Water quality, *Water quality control, *River basins, *Water resources, *New England, River Basin Commissions, Water consumption, Resources development, Land use, Flood damages, Eutrophication, Water supply, Interbasin transfers, Wetlands, Erosion, Water requirements, Regional planning, Resource assessment, Vessel discharges, Energy facility siting.

This report summarizes much of the work carried out through the New England Regional Assessment Program and presents the conclusions and recommendations developed in response to a final list of severe resource problems in New England. The New England Region encompasses 74,640 square miles and six states. Eighty percent of the region is forested; 10% is cropland, pasture and wetland; 5% is developed; and 3% is composed of streams and rivers. The region supports 12 1/2 million people with most of the population centers near the coast or on rivers. The report describes 23 significant environmental problems resulting from development and human activities; it outlines the objectives of government policies dealing with the problems; and offers recommendations to ameliorate the problems. The recommendations are divided into data collection needs, additional research areas, special studies and legal, institutional, and policy changes. Some of the problems are point

source pollution, discharges from small vessels, inappropriate land use, loss of prime agricultural land, loss of key historical and prehistoric sites, and others. Tables are provided, listing the socio-economic characteristics of the region, such as population, total employment, earnings, income, land use. Other tables list the water requirements, both withdrawal and consumptive use of freshwater and saline water, for residential, industrial and agricultural purposes; and flood damages and frequency of flooding. An identification and discussion of 22 regional assessment problem areas is provided with an in-depth listing of their environmental problems in tabular form. The problem areas are the major river basins and coastal zones throughout New England. (Coan-NC)

W79-03151

ENVIRONMENTAL POLLUTION CONTROL: TWO VIEWS FROM THE GENERAL POPULATION,

Kansas State Univ., Manhattan. Dept. of Political Science.

P. Althoff, and W. H. Greig. Environment and Behavior, Vol. 9, No. 3, p 441-456, September 1977. 2 tab, 20 ref.

Descriptors: *Attitudes, *Decision-making, *Social values, *Pollution, *Environmental concern, *Government policy, *Public opinion, Abatement, Kansas, Environmental pollution control.

This study explored the opinions of a random sample of the general population of the state of Kansas concerning the environmental pollution controversy and how it should be dealt with. Five clusters—environmental concern, governmental trust, industrial trust, environmental protector, and personal commitment, are formulated for the data and are used as the basis for the discussion of findings. Respondents in each cluster were asked 3 questions. Relationships between the five clusters and 15 specific variables—socioeconomic and policy related issues—are presented. It was found that the respondents were concerned about the environmental issue, were not particularly trusting of governmental and industrial efforts to solve the pollution problem, were only somewhat dedicated to environmental protection, and were relatively committed personally to aid in solving the problem. Those living in urban areas, who were younger and had higher levels of education and higher incomes tended to be more concerned about environmental issues, less trusting of both governmental and industrial efforts, more personally committed to environmental aid in solving pollution problems and more dedicated to environmental protection than those living in small towns and rural areas, who were older and had less education and lower incomes. The authors indicate that the findings of the study may have severe implications for the future of pollution control policy-making. (Arnold-NC)

W79-03154

RED RIVER OF THE NORTH BASIN.

Environmental Protection Agency, Denver, CO. Region VIII.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-255 248, Price codes: A07 in paper copy, A01 in microfiche. December 1972. 136 p.

Descriptors: *Water quality, *Water resources development, *Water pollution, *Waste water treatment, *North Dakota, *Red River of the North River Basin, *Red River Basin(ND), Coliform, Biological oxygen demand, Dissolved oxygen, Industrial wastes, Total suspended solids, Sewage, Sewage treatment, Regional planning.

The Red River of the North River Basin encompasses portions of North Dakota, Iowa, Minnesota, and the Dominion of Canada. Because of Red River Basin involves three state governments, two EPA regional jurisdictions, and the Canadian government, pollution problems are extremely complex. The area of primary effort for Region VIII is the State of North Dakota. The major industrial pollution in the Basin stems from sugar beet mill

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

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operations while other pollution problems are caused by discharging wastewater effluent under ice, resulting in high oxygen deficiencies. Because most dischargers release their wastes during spring and fall, which is also the peak time for sugar beet processing, a large slug loading is deposited upon the river system at these times. The report offers a comprehensive assessment of pollutant loadings in all receiving waters in the Red River Basin and gives tactical solutions for what are viewed as major problems. Tables are presented showing total basin loads of biological oxygen demand and total suspended solids for fiscal years 1973, 1974, 1975 and 1976. Planned accomplishments are listed in chronological order showing which specific actions EPA administrators should take when solving Red River pollution problems. A long section of the report is devoted to point source loads and locations. These tables list principal dischargers, a series of waste parameters and present loads of these parameters, and loads for fiscal years 1973, 1974, 1975 and 1976. Also, information on the type of waste treatment facility and effluent requirements is shown. The report ends by describing which actions dischargers should take to bring their wastes in line with water quality standards. (Coan-NC) W79-03156

ENVIRONMENTAL AND ECONOMIC PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE BURNS WATERWAY HARBOR, INDIANA.

Comptroller General of the United States, Washington, DC.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 325, Price codes: A03 in paper copy, A01 in microfiche. Prepared for the Corps of Engineers, Washington, DC. September 20, 1971. 44 p, 7 append.

Descriptors: *Water quality, *Industrial wastes, *Water pollution, *Burns Waterway Harbor(IN), *Dunes National Lakeshore Park(IN), Water pollution effects, Water pollution abatement, Water pollution control, Waste water pollution, Water resources development, Recreation, Transportation, Harbors, Environmental effects, Air pollution, Indiana, Economic development.

The Burns Harbor Waterway is located on the shore of Lake Michigan about 18 miles east of the Illinois-Indiana state line. The harbor is bordered on the west by the Midwest Steel Division of National Steel Corporation, and on the east by Bethlehem Steel Corporation. The National Park Service (NPS), Department of the Interior, is acquiring land on both sides of the harbor area for development of the Indiana Dunes National Lakeshore Park. The report discusses the environmental and economic problems associated with the development of the harbor as a transportation facility for the two steel mills. It describes Indiana's air and water pollution control programs and their general inadequacy in controlling pollution in the harbor. The major deterrents to implementing effective monitoring and control programs are the lack of financial resources and the need to strengthen the air and water pollution control legislation and regulations. The report also points out that while control of water pollution is primarily a State responsibility, legal provisions allowing and encouraging localities to establish air quality control programs exist. Porter County, which has jurisdiction over the harbor and Dune areas, does not have adequate legislation, financial resources, or qualified personnel to control the problem. Questions are raised concerning assurances made by the State of Indiana regarding public terminal and transfer facilities to be provided at the harbor. The master plan showed an estimated cost of \$38.6 million for these facilities. The major conclusion is that pollution from existing and future development in the Burns Harbor Waterway area, unless adequately controlled, will have a detrimental effect upon the Dunes area. (Coan-NC) W79-03157

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME I: MAIN REPORT. Army Engineer District, St. Louis, MO. For primary bibliographic entry see Field 6B. W79-03164

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME II, APPENDIX A: THE ECONOMY AND CHARACTER OF THE MERAMEC, Washington Univ., St. Louis, MO. For primary bibliographic entry see Field 6B. W79-03165

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME III, APPENDIX B: WATER NEEDS AND PROBLEMS, Washington Univ., St. Louis, MO. E. L. Ullman, R. R. Boyce, D. J. Volk, and B. T. Bower. December 1961. 230 p, 5 chapters.

Descriptors: *Water resources, *Economics, *Flood damage, *Water supply, *Water quality, *Waste water disposal, *Recreation, *Meramec River(MO), Water requirements, Missouri, Economic efficiency, Cost-benefit analysis, Economic impact, Flood control, Flood data, Flood flow, Flood forecasting, Flood frequency, Flood plains, Flood protection, Non-structural measures, Water supply development, Cities, Industries, Ground water availability, Surface water availability, Waste disposal, Recreation demand, Recreation facilities, St. Louis(MO).

This Study was undertaken to devise a program for development of the Meramec Basin's water and related land resources to meet both short- and long-term needs. This volume deals with water needs and problems, and is comprised of five distinct chapters. The first deals with methods of economic analysis. Economic assumptions and procedures used in benefit-cost analyses are reviewed. Outputs and benefits from water resource systems are outlined, with special attention given to flood damage reduction, navigation, water supply and quality, fisheries, recreation and power. Ch. 2 is concerned with flood damage reduction. Both structural and non-structural methods are reviewed, flood problems assessed, benefits from flood damage reduction estimated, and future flood damage-discharge relationships outlined. Ch. 3 discusses municipal and industrial water supply. Water supplies in both the Meramec Basin and the St. Louis area are inventoried, as are the municipal and industrial water supply requirements in both the Basin and the St. Louis area. Ch. 4 is concerned with waste disposal and water quality. Sources of pollution in the Basin are identified, water quality is assessed, and the effect of increased streamflows is reviewed. Industrial wastes are inventoried. Ch. 5 deals with recreation. National trends are discussed, followed by an assessment of the demand for water recreation in the Basin. An estimation of benefits from basin reservoirs provided, the impact of recreation on local economies and on the St. Louis area is presented, characteristics of needed recreation facilities are discussed and recreation needs for the Basin and St. Louis are summarized. (See also W79-03164) (Zayac-NC) W79-03166

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME VII. APPENDICES M THROUGH S. Army Engineer District, St. Louis, MO. For primary bibliographic entry see Field 6B. W79-03170

COMMENTS ON ADVANCE COPY OF SUMMARY REPORT ON MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY. Army Engineer District, St. Louis, MO. For primary bibliographic entry see Field 6B. W79-03172

EFFECT OF AN ORGANOPHOSPHORUS INSECTICIDE, ABATE, USED IN THE CONTROL OF SIMULIUM DAMNOSUM ON NON-TARGET BENTHIC FAUNA, Ghana Inst. of Aquatic Biology, Achimota. For primary bibliographic entry see Field 5C. W79-03174

COST OF SOCIAL AND ENVIRONMENTAL REGULATIONS IN CONSTRUCTION, Ohio Northern Univ., Ada. E. Koehn, R. E. Benson, Jr., and D. Shank. Journal of the Construction Division of the American Society of Civil Engineers, Vol. 104, No. 2, p 117-122, June 1978. 1 fig, 4 tab, 7 ref.

Descriptors: *Construction costs, *Pollution abatement, *Social aspects, *Regulation, *Environmental effects, *Opinion surveys, Costs, Industrial wastes, Federal government, Ohio, Construction, U.S. Environmental Protection Agency, Occupational Safety and Health Administration, Nuclear Regulatory Commission, Equal Employment Opportunity Commission.

Effects of environmental and social regulations of four governmental agencies on construction industry costs were assessed by means of an opinion survey of 400 large contractors in a list compiled by Engineering News-Record, and 476 smaller contractors listed in the Ohio Contractors Association Directory. The great majority of contractors (88% of the ENR 400 and 84% of the OCA group) said that social and environmental controls have measurable increased construction costs. About three-fourths of the respondents also felt that generally accepted construction practices satisfy requirements of the regulations. The weighted mean percentage of construction costs spent for social and environmental controls was 10.7% for the ENR 400 and 11.9% for the OCA group. The weighted and unweighted means were quite close for the ENR 400, indicating percentage allocated for controls does not vary greatly with the organization's dollar value; this is not the case for the OCA group. A representative sample of comments taken from the questionnaires is included. Regulatory agencies considered in this paper are: the Environmental Protection Agency (EPA), Occupational Safety and Health Administration (OSHA), Nuclear Regulatory Commission (NRC), and the Equal Employment Opportunity Commission (EEOC). Costs are itemized by agency. (Lynch-Wisconsin) W79-03191

AN APPROACH TO THE OPTIMAL CONTROL OF POLLUTION IN BOUNDARY WATERS, Guelph Univ. (Ontario). Dept. of Economics. B. A. Forster. Discussion Paper No. 77-10. 17 p, 3 fig, 21 ref.

Descriptors: *Water pollution control, *Boundary waters, *Optimization, *Economics, *Mathematical models, *International water boundaries(Property), Theoretical analysis, Model studies, Dynamic models, International Joint Commission, Canada, United States, Economic efficiency, Great Lakes, History, Treaties, International waters.

An aggregate model of pollution and economic activity developed by the author in a previous paper is modified to include two countries (such as Canada and the United States), facilitating analysis of problems involving pollution in international boundary waters. It is assumed that the two countries share a common waterway, such as the Great Lakes, which is polluted as a result of normal economic activity. A Bolza-Hestenes optimal control formulation involving an isoperimetric constraint was constructed and analyzed. The resultant strategy is dynamically Pareto efficient; it is not possible to make one nation better off without making the other worse off. Redistribution which takes place in the model does not involve real productive resources in a geographical sense; each country must live within its own production constraint. Redistribution takes place through the level

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Group 5G—Water Quality Control

of pollution in the boundary water. The model assumes each country produces a fixed flow of output. Evolution of the pollution stock depends upon the size of the waste flow and the assimilative capacity of the waterway. A decay function is included. The Canadian-American International Joint Commission was established following signing of the Boundary Waters Treaty by Britain and the U.S. in 1909 (ratified by Canada in 1911). The IJC's initial focus on efficient use of boundary waters shifted in 1912 to concern for pollution. In 1972 the Great Lakes Water Treaty was signed. (Lynch-Wisconsin)
W79-03195

ELEVENTH HOUR AMENDMENT TO FWPCA RESUSCITATES EPA'S HAZARDOUS SUBSTANCE DISCHARGE PROGRAM,
For primary bibliographic entry see Field 6E.
W79-03205

THE FATE OF NON-COMPLIANT MUNICIPALITIES WITH REGARD TO THE SECONDARY TREATMENT STANDARDS PURSUANT TO THE 1972 FEDERAL WATER POLLUTANT CONTROL ACT AMENDMENTS - A PROBLEM OF ENFORCEMENT,
For primary bibliographic entry see Field 6E.
W79-03208

CUSTOM AND LAND-BASED POLLUTION OF THE HIGH SEAS,
For primary bibliographic entry see Field 6E.
W79-03215

CONGRESS, THE COURT, AND WATER POLLUTION,
Chicago Univ. Law School, IL.
For primary bibliographic entry see Field 6E.
W79-03223

AGRICULTURAL WATER QUALITY ACT.
For primary bibliographic entry see Field 6E.
W79-03225

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PORTLAND, ME.).
For primary bibliographic entry see Field 6E.
W79-03226

OIL SPILL LIABILITY AND COMPENSATION.
For primary bibliographic entry see Field 6E.
W79-03228

OILSPILL CONTINGENCY PLAN.
For primary bibliographic entry see Field 6E.
W79-03231

PROTECTION AND ENHANCEMENT OF SOIL AND WATER RESOURCES.
For primary bibliographic entry see Field 6E.
W79-03234

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (FORT COLLINS, COLORADO).
For primary bibliographic entry see Field 6E.
W79-03236

IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT (REGULATION AND MONITORING OF TOXIC AND HAZARDOUS CHEMICALS).
For primary bibliographic entry see Field 6E.
W79-03237

MORSE V. OREGON DIVISION OF STATE LANDS (AGENCY OVERSTATED ITS AU-

THORITY WHEN IT PERMITTED A LAND-FILL FOR A NON-WATER-RELATED ACTIVITY.

For primary bibliographic entry see Field 6E.
W79-03238

DEPARTMENT OF TRANSPORTATION V. PSC RESOURCES, INC. (PROPERTY OWNER'S STANDING UNDER ENVIRONMENTAL RIGHTS ACT TO ENFORCE WATER QUALITY IMPROVEMENT ACT UPHELD).
For primary bibliographic entry see Field 6E.
W79-03242

INACTIVE AND ABANDONED UNDERGROUND MINES. WATER POLLUTION PREVENTION AND CONTROL.
Baker (Michael), Jr., Inc., Beaver, PA.

R. L. Scott, and R. M. Hays.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-258 263, Price codes: A14 in paper copy, A01 in microfiche. Report No. EPA-440/9-75-007, June 1975. 293 p. 54 fig, 14 tab, 132 ref. 68-01-2907.

Descriptors: *Water pollution control, *Mine drainage, *Underground structures, *Acid mine water, Water quality control, Pollution abatement, Water pollution sources, Costs, Mineral industry, Mine wastes, Mine water, Metals, Nonmetals, Coal, Thorium, Uranium.

The chemistry and geographic extent of mine drainage pollution in the U.S. from inactive and abandoned underground mines is discussed; underground mining methods are surveyed. Mine drainage control technology, largely developed in eastern U.S. coal fields and not always applicable to other regions and other mineral mining, are classified into two main categories: (1) at-source and (2) treatment. At-source mine drainage pollution prevention and control techniques are evaluated and described according to the following classifications: water infiltration control; mine sealing; mining techniques; water handling; and discharge quality control. Appropriate cost data is related, examples technique implementation are given. A summary of the mineral commodities mined in the U.S. includes location and the environmental effects associated with mining them. An extensive bibliography is provided. (Davison-IPA)
W79-03247

CONTINGENCY PLAN FOR CONTROL AND TREATMENT OF ACCIDENTAL SPILLS OF TOXIC CHEMICALS FROM ELECTROPLATING PROCESSES,
Army Materiel Command, Texarkana, TX.
R. A. Raby.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A009 197, Price codes: A03 in paper copy, A01 in microfiche. Final Report No. USAMC-ITC-02-08-75-216, March 1975. 45 p. 3 fig, 1 tab, 11 ref, 1 append.

Descriptors: *Spills, *Waste treatment, *Water pollution control, Toxicity, Industrial wastes, Liquid wastes, Water pollution treatment, Neutralization, Oxidation, Chemical reactions, Cyanide, Acids, Red River Army Depot, Texarkana, Texas.

Methods for treating spills of three types of electroplating process solutions are evaluated. Results of experiments using ferrous sulphate and sodium metabisulphite to treat hexavalent chrome verify their effectiveness. Treatment of cyanides by catalytic oxidation and alkaline chlorination yielded satisfactory results. Acids were neutralized with hydrated lime, soda ash, and caustic soda. A contingency plan for the electroplating shop at Red River Army Depot in Texarkana, Texas, to detect and treat spills is presented; a general discussion of this shop is included. (Davison-IPA)
W79-03248

CONTROL OF WASTE AND WATER POLLUTION FROM POWER PLANT FLUE GAS

CLEANING SYSTEMS: FIRST ANNUAL R AND D REPORT,

Aerospace Corp., El Segundo, CA. Environment and Energy Conservation Div.

P. P. Leo, and J. Rosoff.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 211, Price codes: A09 in paper copy, A01 in microfiche. Report No. EPA-600/7-76-018, October, 1976. 170 p. 25 fig, 33 tab, 45 ref. 68-02-1010.

Descriptors: *Waste treatment, *Industrial wastes, *Electric power plants, Water pollution sources, Coal, Research and development, Projects, Water reuse, Lime, Leaching, Water pollution control, Waste disposal, Water quality, Gypsum, Fertilizers, Waste identification, Chemical properties, Physical properties, Power plants, Gases, Reclaimed water, Ponds.

An assessment of the continuing research and development work in the field of coal-fired utility power plant flue gas cleaning (FGC) waste treatment, disposal, and utilization is presented. Overall power plant water recycle and reuse is included in the assessment. Results from 19 projects cover the following: (1) chemical and physical characterization of wastes from eastern and western U.S. plants using lime, limestone, or double-alkali scrubbing systems; (2) chemical and physical properties and leaching characteristics of treated and untreated wastes; (3) field evaluations of treated and untreated waste disposal; (4) disposal and utilization alternatives; (5) cost estimates for ponding and for fixation disposal methods; (6) disposal standards; (7) gypsum production and marketing; (8) potential use of wastes in fertilizer and portland cement production; and (9) beneficiation studies. The results from this program will be used to provide a data base for defining waste disposal standards and predicting effects on ground and surface water quality. (Davison-IPA)
W79-03251

CONSTRUCTION GRANTS PROGRAM INFORMATION: INDUSTRIAL COST RECOVERY SYSTEMS,

Environmental Protection Agency, Washington, DC. Municipal Construction Div.

Report No. MCD-44, November 1976. 62 p. 22 fig, 4 append.

Descriptors: Publications, *Waste treatment, *Treatment facilities, *Cost allocation, Federal project policy, Cost repayment, Project planning, Grants, Financing, Industrial cost recovery systems.

Supplemental information describing the essential requirements of the 'Federal Guidelines-Industrial Cost Recovery Systems' (ICR) and describing other related requirements is presented. Use of this information will assist grantees in the design, installation and implementation of their systems. A flow chart traces the relationships of the ICR and user charge systems; major requirements of the guidelines are referenced. The development of an ICR system is described and industrial users are identified and classified to determine financial data and ICR payments. Funds management systems are discussed, and examples of various records are given. A check list is provided to assist the grantee in completing system requirements within the necessary time. (Davison-IPA)
W79-03252

A STUDY OF COAL-ASSOCIATED WASTES RESULTING FROM THE MINING, PROCESSING AND UTILIZATION OF COAL,
West Virginia Univ., Morgantown. Coal Research Bureau.

Quarterly Report No. 15, Report No. FE-1218-3, January 1976. 13 p. 3 fig, 1 tab. E (49-18)-1218.

Descriptors: *Mine wastes, *Waste treatment, *Recycling, *Coal mine wastes, Acid mine drainage, Research and development, Testing, Fly ash, Coal, Copper, Byproducts, Concretes, Concrete additives.

Results associated reported. did not soil mining' while minerals in Recent work the product European method of throughout premixing sample of Research mine drain limitations resulted in utilization p W79-03255

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Descriptors, *Odor Gas chrom Sampling, A environment Missouri.

An evaluation City, Mis Midwest R The finger a concentrat in the air samples each potent constituents topography (C used with was obtained ground sam from five p analyses we analyses to i complaints. fluent from were Chem Chemical C these two effluent from minor contr IPA) W79-03256

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METHANO AS AN AG ER, Department June 17, 1976

Descriptors: trol, *Applicatcides, Fertil pollution co ment, Soil tr

WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

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Results continuing research on waste byproducts associated with coal utilization and conversion is reported. Simple water leaching of the minerals did not solve the problem of efflorescence or 'summing' which is due to the presence of soluble minerals in fly ash based fired structural products. Recent work to develop a mixing procedure for the production of aerated concrete comparable to European products involved the development of a method of distributing aluminum powder evenly throughout the sample. Test results indicate that premixing the powder and water produces a sample of higher quality than previous methods. Research efforts in recovering copper from acid mine drainage (AMD) sludge have examined the limitations of the individual process steps, which resulted in a better understanding of this potential utilization plan. (Davison-IPA). W79-03255

EVALUATION OF SOURCES OF ODOR POLLUTION IN AN AREA OF KANSAS CITY, MISSOURI.

Midwest Research Inst., Kansas City, MO. Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 868, Price codes: A03 in paper copy, A01 in microfiche. Final Report, 1974. 41 p, 4 fig, 11 tab. 3701-C, 68-01-0453.

Descriptors: *Air pollution, *Pollutant identification, *Odor, Industrial effluents, Laboratory tests, Gas chromatography, MRI Fingerprint method, Sampling, Analytical techniques, Urban areas, Air environment, Air pollution effects, Kansas City, Missouri.

An evaluation of potential odor sources in Kansas City, Missouri, was accomplished by utilizing the Midwest Research Institute 'fingerprint' method. The 'fingerprint' method involves: (1) collection of a concentrated sample of the volatile contents present in the air during an odor episode; (2) collection of samples in the air upwind and downwind of each potential odor source; and (3) separating the constituents of each sample by gas-liquid chromatography (GLC). Flame ionization detection was used with GLC separation. The best separation was obtained by SF-96 and FFAP columns. Background samples and source samples were collected from five potential odor sources. Source sample analyses were compared with background sample analyses to identify the specific sources of the odor complaints. One complaint sampling contained effluent from four sources; the major contributions were Chemagro Corporation and Conservation Chemical Company. In all odor episodes analyzed, these two companies were the major contributors; effluent from American Oil Corporation was a minor contributor during one episode. (Davison-IPA) W79-03256

CHEMICAL ANALYSIS OF INTERSTATE CARRIER WATER SUPPLY SYSTEMS,

Environmental Protection Agency, Washington, DC.

For primary bibliographic entry see Field 5A.

W79-03259

SCHOOL WATER SUPPLY FLUORIDATION,

Environmental Protection Agency, Washington, DC. Office of Water Supply.

For primary bibliographic entry see Field 5F.

W79-03260

METHANOL TREATED ACTIVATED SLUDGE AS AN AGRICULTURAL CHEMICAL CARRIER,

Department of Agriculture, Washington, DC.

June 17, 1976. 34 p, 13 tab.

Descriptors: *Agricultural chemicals, *Chemcontrol, *Application method, *Activated sludge, Pesticides, Fertilizers, Plant growth regulators, Water pollution control, Sprays, Granules, Seed treatment, Soil treatment, Methanol, Sludge.

A method for the controlled, sustained release of agricultural chemicals to their target organisms is described. The method employs a methanol treated activated sludge carrier, and has application in forming sprayable films, granular pellets, and seed coatings, resistant to the natural mechanisms of chemical loss. Pesticides and fertilizers normally applied directly to the soil, plant foliage or an inert carrier are particularly suitable for use with this method. (Davison-IPA). W79-03262

GUIDANCE FOR PREPARING A FACILITY PLAN, MUNICIPAL WASTEWATER TREATMENT WORKS, CONSTRUCTION GRANTS PROGRAM,

Environmental Protection Agency, Washington, DC. Municipal Construction Div. Available from the National Technical Information Service, Springfield, VA 22161 as PB-257 652, Price Codes: A04 in paper copy, A01 in microfiche. Report No. MCD-46, May 1975. Supercedes 'Guidance for Facilities Planning,' January 1974. 62 p, 26 ref, 3 append.

Descriptors: *Waste water treatment, *Treatment facilities, *Municipal wastes, *Federal Water Pollution Control Amendments, *National Environmental Policy Act, Planning, Legal aspects, Publications, Regulation, Grants, Government finance, Design criteria, Cities.

Suggested procedures for preparing a facility plan for publicly-owned treatment works are presented. This plan is the first stage in a three stage process required of a municipality desiring a Federal grant under the Federal Water Pollution Control Amendments of 1972 (FWPCA) to construct a treatment works. Requirements and regulations contained in the two major laws, FWPCA and the National Environmental Policy Act (NEPA), are described. The following areas are discussed in detail: (1) facility plan; (2) public participation; (3) evaluation of costs; (4) environmental evaluation; (5) plan selection; (6) format for plan submission; and (7) review, certification and approval of plans. The construction grant regulation is provided in appendix B. (Davison-IPA) W79-03263

ALTERNATIVE INSTITUTIONAL AND FINANCIAL ARRANGEMENTS FOR AREAWIDE WASTE TREATMENT MANAGEMENT,

Banks (Harvey O.) Consulting Engineer, Inc., Belmont, CA.

H. O. Banks, and H. J. Owen.

Available from the National Technical Information Service, Springfield, VA, as PB-253 318, Price Codes: A 08 in paper copy, A01 in microfiche. January 1974. 175 p, 2 fig, 5 tab, 105 ref, 2 append. 68-01-2909.

Descriptors: *Waste treatment, *Project planning, *Financing, *Management, Water quality, North Carolina, Ohio, Maine. Water resources development, Comprehensive planning, Regional development, Water law, Water requirements, Water Quality Control Act.

Results of a study to identify and describe components inherent in selecting institutional and financial arrangements which might be used in implementing areawide waste treatment management plans are reported. The related tasks of the study included a literature review, case study investigations, a comparative analysis of the case study findings, and the preparation of recommendations. The case study areas selected represent a wide range in the following: water quality problems to be solved, existing institutional framework, geographic location, and character of the planning area. It was generally concluded that adequate information can be obtained at the inception of the planning process to identify the depth and detail of institutional and financial studies requisite to developing areawide waste treatment management plans. Thirly general conclusions and recommendations, for the case study areas are presented. Institutional and financial aspects of areawide waste treatment management are detailed and case

studies involving the areas of Youngstown, Ohio, Raleigh - Durham, North Carolina, and Southern Maine are reported. (Davison-IPA) W79-03265

SURVEY OF METHODS USED TO CONTROL WASTES CONTAINING HEXACHLOROBENZENE,

TRW Systems, Inc., Redondo Beach, CA. For primary bibliographic entry see Field 5E. W79-03266

WASTEWATER TREATMENT TECHNOLOGY DOCUMENTATION FOR ALDRIN/DIELDRIN MANUFACTURE,

Midwest Research Inst., Kansas City, MO. For primary bibliographic entry see Field 5D. W79-03267

NOMOGRAPHS FOR TEN-MINUTE UNIT HYDROGRAPHS FOR SMALL URBAN WATERSHEDS,

American Society of Civil Engineers, NY. Urban Water Resources Research Council. For primary bibliographic entry see Field 6B. W79-03272

URBAN RUNOFF CONTROL PLANNING,

American Society of Civil Engineers, NY. Urban Water Resources Research Council. For primary bibliographic entry see Field 6B. W79-03273

THE PESTICIDE CONTENT OF SURFACE WATER DRAINING FROM AGRICULTURAL FIELDS-A REVIEW,

Science and Education Administration, Stoneville, MS. Southern Water Science Lab. For primary bibliographic entry see Field 5B. W79-03289

OIL BOOM,

British Petroleum Co. Ltd., London (England). (Assignee).

M. G. Webb. U.S. Patent No. 4,112,689, 5 p, 3 fig, 6 ref; Official Gazette of the United States Patent Office, Vol 974, no 2, p 624, September 12, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Water pollution control, Water quality control, Barriers, Floating, Weirs, Equipment, *Oil booms, Containment(Wastes), Oil recovery.

A barrier for the containment and recovery of oil spill on water comprises at least one elongated, flexible buoyant chamber, at least one elongated, flexible ballast water chamber and at least one further flexible water chamber of greater buoyancy than the ballast chamber. The buoyant chamber and the further water chamber are each joined to the ballast water chamber in side by side relationship and the chambers are so positioned relative to one another that when in use on water the buoyant chamber and the ballast water chamber together form a barrier for oil spill on water. The further water chamber defines a weir between itself and the other chambers and the weir is provided with means to remove oil and water. (Sinha - OEIS) W79-03311

APPARATUS FOR SEPARATION OF OIL FROM OIL AND WATER MIXTURES,

Simon-Hartley Ltd, Stoke-on-Trent (England). K. H. Toft. U.S. Patent No. 4,115,279, 4 p, 4 fig, 10 ref; Official Gazette of the United States Patent Office, Vol 974, No. 3, p. 1492, September 19, 1978.

Descriptors: *Patents, *Oil pollution, *Oily water, *Water pollution treatment, Water quality control, Separation techniques, Laminar flow, Equipment, Ballast water.

Field 5—WATER QUALITY MANAGEMENT AND PROTECTION

Group 5G—Water Quality Control

An apparatus separates oil from a mixture of oil and water. A stream of the mixture is directed along an upwardly inclined inverted channel. The apparatus is designed to direct the intended rate of flow of liquid to ensure that laminar flow takes place. As the mixture flows upwardly globules of oil form, float to engage the under-surfaces and become trapped in the apices of the inverted channels and thus are separated from the remainder of the stream. The length of the structure is such as to ensure that substantially all the oil contained within the mixture is separated by the time the mixture reaches the upper end. The oil is collected from the upper longitudinal end of the channel and the remainder of the stream is allowed to fall downwardly out of the channel. (Sinha - OEIS) W79-03327

DEPLOYABLE BARRIER APRON APPARATUS FOR USE WITH CONTAMINANT RECOVERY SYSTEMS,
Oil Spill Recovery, Inc., Northbrook, IL. (Assignee).

M. D. Stagemeyer.
U.S. Patent No. 4,116,007, 7 p, 10 fig, 5 ref; Official Gazette of the United States Patent Office, Vol. 974, No. 4, p. 1758, September 26, 1978.

Descriptors: *Patents, *Oil pollution, *Oil spills, *Barriers, Water pollution control, Water pollution treatment, Water quality control, Floating, *Containment(Wastes), Contaminant recovery, Deployment.

A readily deployable barrier apron is used with contaminant recovery systems to encompass contaminant material or to channel such material to collection devices. An upper apron member which is impenetrable has a lower penetrable member attached. Deployment devices such as hinging segments or spooling rolls of such apron barrier are utilized with an uprigting construction to provide for a quickly deployable, ready to use, and easy to control barrier construction for such uses as the containment of oil spills. (Sinha - OEIS) W79-03328

METHOD OF REGULATING THE GROWTH OF AQUATIC WEEDS WITH PYRIDINE DERIVATIVES,
Lilly (Eli) and Co., Indianapolis, IN. (Assignee).
For primary bibliographic entry see Field 4A. W79-03329

METHOD AND APPARATUS FOR REMOVING CONTAMINANTS FROM BODIES OF WATER,
Oil Spill Recovery, Inc., Northbrook, IL. (Assignee).
M. D. Stagemeyer, and S. F. Allcorn.
U.S. Patent No. 4,116,833, 11 p, 16 fig, 10 ref; Official Gazette of the United States Patent Office, Vol. 974, no. 4, p 2030, September 26, 1978.

Descriptors: *Patents, *Oil spills, *Skimming, *Barriers, Water quality control, Water pollution treatment, Equipment, Contaminant recovery, *Oil pollution.

A method and apparatus for removing petroleum and other spilled contaminant materials from the surface of a body of water is described. An open-ended barricade is directed into and about a contaminant mass to channel the contaminant material to skimming apparatus which assists in collecting the material for recovery, storage and reuse. The process and apparatus is especially adaptable for use in naturally flowing bodies of water into which the apparatus is restrainingly positioned to continuously and automatically remove the contaminant material. By maneuvering the outermost ends of the barricade, it can be formed into funneling means for converging the material toward the collection area. (Sinha - OEIS) W79-03332

POLLUTION CONTROL SYSTEM,
Savage Technical Services, Inc., Clark, NJ. (As-

signee).
A. B. Bertelson.
U.S. Patent No. 4,116,835, 7 p, 4 fig, 9 ref; Official Gazette of the United States Patent Office, Vol. 974, No. 4, p 2031, September 26, 1978.

Descriptors: *Patents, *Waste water treatment, *Industrial wastes, *Oil pollution, *Water pollution treatment, Separation techniques, Coalescence, Adsorption.

Oil and other contaminants are separated from aqueous effluents by a system which includes means for introducing the contaminated effluents into a separation zone where they are passed through the labyrinth course of a coalescing chamber to separate oil particles. The oil is removed by means of a skimmer and moved into an oil storage area. The aqueous effluents are then passed from the bottom of the separation zone to an extraction zone where they are passed through a bed of a material capable of adsorbing hydrocarbons and other pollutants. The effluent may then be discarded or may be moved through a fail safe system designed to assure that hydrocarbon removal is complete in all instances. (Sinha-OEIS) W79-03334

MECHANICS OF A RESTRAINED LAYER OF FLOATING OIL ABOVE A WATER CURRENT,
Massachusetts Inst. of Tech., Cambridge.

J. H. Milgram, and R. J. Van Houten.
Journal of Hydraulics, Vol 12, No. 3, p 93-108, July 1978. 20 fig, 1 tab, 15 ref.

Descriptors: *Oil pollution, *Barriers, *Shear stress, *Currents(Water), Water pollution effects, Oil-water interfaces, Outer Continental Shelf, Water currents, Dynamic pressure.

The relative importance of interfacial shear stress and dynamic pressure in determining the thickness distribution of a layer of floating oil contained by a barrier above a water current is determined. This is done by use of an equation relating vertical location of the oil-water interface, dynamic pressure, and shear stress. The interfacial shape is measured experimentally. The dynamic pressure is determined by numerical solution of the potential flow problem for flow beneath the measured shape. The aforementioned equation then yields the shear stress distribution. The rear portion of restrained oil layers are found to be governed by shear stress as are the forward portions for low current speeds. At higher current speeds, both dynamic pressure and shear stress are important in determining the shape of the forward portions. Large friction coefficients are shown to be due to flow over a rough interface resulting from the generation of Kelvin-Helmholtz waves on the interface. The entrainment of oil droplets into the water flow is shown to be the result of breaking of the Kelvin-Helmholtz waves. (Sinha-OEIS) W79-03373

APPLICATIONS OF SEASAT TO THE OFFSHORE OIL, GAS, AND MINING INDUSTRIES,
Battelle Columbus Lab., OH.

A. G. Mourad, and A. C. Robinson.
Journal of Hydraulics, Vol 12, No 4, p 137-141, October 1978. 1 fig, 1 tab, 8 ref.

Descriptors: *Satellites(Artificial), *Remote sensing, *Oil spills, *Mining, Gases, Water pollution, Resources development, Environmental effects, Monitoring, *Outer Continental Shelf, *Seasat-1, Offshore industries.

Seasat-1, a NASA satellite launched in June 1978, was designed to provide synoptic, repetitive data on the ocean areas of the world. Seasat-1 carries five sensors, four with all-weather capability. The principal data products will be surface wind speed and direction, ice characteristics, and ice movement. One of NASA's objectives is to demonstrate Seasat capability and to permit evaluation of the practical value of the data to offshore industry users. Thus, this paper describes several industrial experiments planned by NASA during the oper-

ation of Seasat-1. These experiments are to be conducted with several industries, including oil, gas and mining organization which will be investigating the usefulness of the data. Applications include (1) improvements in weather and wave forecasts, (2) improved knowledge of past wind and wave statistics for setting design requirements, and (3) monitoring ice formation, breakup, and movement in arctic regions. A number of geographical areas are being examined, including the Beaufort Sea, Labrador Sea, Gulf of Mexico, U.S. East Coast, West Africa, Equatorial East Pacific, Bering Sea, and the North Sea. These investigations are being done jointly by NASA and the participating industrial organizations. NASA will provide the appropriate Seasat-derived data, and the industrial organizations will compare these data with their own observations and estimate the usefulness to offshore operations. Results will be available to the entire offshore industry and to the general public once the evaluations are completed. (Sinha-OEIS) W79-03374

OCS OIL AND GAS: AN ASSESSMENT OF THE DEPARTMENT OF THE INTERIOR ENVIRONMENTAL STUDIES PROGRAM,
National Academy of Sciences-National Research Council Washington, DC. Committee on Natural Resources.

For primary bibliographic entry see Field 6G. W79-03376

AN EVALUATION OF OIL AND GREASE CONTAMINATION ASSOCIATED WITH DREDGED MATERIAL CONTAINMENT AREAS,
Engineering-Science, Inc./Texas, Austin.
For primary bibliographic entry see Field 5B. W79-03377

FIELD INVESTIGATIONS OF CONVERGENCES AND SLICK CONCENTRATION MECHANISMS IN DELAWARE BAY. RESEARCH ON THE EFFECTS OF CRUDE OIL TRANSFER AND UPSTREAM REFINERIES ON DELAWARE BAY,
Delaware Univ., Newark. Coll. of Marine Studies. For primary bibliographic entry see Field 5B. W79-03378

THE LEGAL ASPECTS OF POLLUTION - THE UK PICTURE WITH E.E.C. COMPLICATIONS,
British Paper and Board Industry Federation, London (England).
For primary bibliographic entry see Field 6E. W79-03388

ENVIRONMENTAL PROTECTION ON CANADA'S WEST COAST,
Beak Consultants Ltd., Vancouver (British Columbia).
J. E. G. Sikes, and L. E. Harris.

Paper (London), World Development Number, p 23, 27-29, 66, 1978. 3 illus, 2 tab.

Descriptors: *Pulp and paper industry, *Canada, *Water pollution control, *Air pollution control, Governments, Federal government, Water pollution sources, Waste water treatment, Waste treatment, Costs, British Columbia, Regulation, Legislation, Effluents, Discharge(Water). W79-03403

Air and water pollution control by the 25 pulp and paper mills in British Columbia (Canada) is discussed, viz., the working relationships with the provincial and federal environmental regulatory agencies, effluent discharge guidelines, effluent treatment procedures (both external and in-plant), and expenditures since 1970. (Swichtenberg-IPC) W79-03403

POLLUTION CONTROL REGULATIONS AND MONITORING TECHNOLOGY: A REVIEW OF RESEARCH AND DEVELOPMENT FROM THE PULP AND PAPER INDUSTRY,
A CO-PARTNERSHIP.

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WATER QUALITY MANAGEMENT AND PROTECTION—Field 5

Water Quality Control—Group 5G

Victoria Univ. (British Columbia). Dept. of Biology.
For primary bibliographic entry see Field 5A.
W79-03410

APPLYING THE CLEAN WATER LAW TO SOUTHEAST FORESTRY,
Soil Conservation Service, Atlanta, GA.
A. J. Dornbusch, and A. B. Herndon.
Southern Journal of Applied Forestry, Vol. 2, No. 3, p. 74-77, August 1978. 1 fig, 4 ref.

Descriptors: *Water law, *Forestry, Water pollution, Forest management, Federal water pollution control act, Legislation, Water quality act, United States.

Control of any water pollution from forest management is required by the Federal Water Pollution Control Act (PL 92-500). Voluntary programs are acceptable in the Southeastern United States. Plans developed under Section 208 of the Act must include best land management practices, priorities, implementation schedules, evaluation programs, and reporting systems. A key factor is the assessment of types and locations of any water quality problems. Failure of voluntary plans after several years trial may require regulatory approaches to be taken. (Witt-IPC)
W79-03413

IMPROVE IRRIGATION RETURN FLOW QUALITY WITH A WATER RENTAL MARKET,
Colorado State Univ., Fort Collins. Dept. of Economics.
P. C. Huszar, and M. B. Sabey.
Water Resources Bulletin, Vol. 14, No. 4, p 978-987, August 1978. 3 fig, 1 tab, 5 ref.

Descriptors: *Irrigation, *Return flow, *Rental market, *Water quality, *Improvement, *Yakima River valley(Wash), Water allocation(Policy), Crop production, Economic efficiency, Water pollution, Water rights, Linear programming, Mathematical models, Benefits, Costs, Supply schedule, Opportunity costs, Water transfer, Systemsanalysis, Washington.

Current policies for correcting the problem of irrigation return flow pollution tend to attack the symptoms of the problem, rather than its cause. The present institutional arrangement for allocating irrigation water is seen as the source of the problem. This paper examines the water quality benefits of altering the institutional arrangement to allow for irrigation water transfers through a rental market. It is conceptualized that by creating a water rental market, an opportunity cost would be associated with the use of irrigation water such that profit maximizing farmers would be induced to use their water supplies more efficiently and rent the surplus to other irrigators, thus reducing return flow pollution. It is shown that a water rental market could improve water quality in the Yakima River in southcentral Washington by 31 percent as well as increase farm incomes and crop production. (Bell-Cornell)
W79-03420

LAKE QUALITY DISCRIMINANT ANALYSIS,
Michigan State Univ., East Lansing. Dept. of Resource Development.
For primary bibliographic entry see Field 5C.
W79-03422

POTENTIAL USE OF FINELY DISINTEGRATED IRON PYRITE IN SODIC AND IRON-DEFICIENT SOILS,
Colorado State Univ., Fort Collins. Dept. of Agronomy.
For primary bibliographic entry see Field 2G.
W79-03423

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,

Instituto Venezolano de Investigaciones Científicas, Caracas. Lab. de Ingeniería Ambiental.
D. T. O'Laoghaire.
Water Resources Bulletin, Vol. 14, No. 4, p 809-826, August 1978. 1 fig, 4 tab, 34 ref.

Descriptors: *Water quality, *Management, *Optimization, *Algorithms, *Capacity expansion, *Cost minimization, Capita costs, Investment, Linear programming, Integer programming, Operating rules, River basins, Computer programs, Constraints, Dissolved oxygen, Treatment facilities, Equations, Mathematical models, Systems analysis, Developing countries.

Described is a mathematical model, an algorithm, and a computer program that were specially developed to study the problem of a water quality management system undergoing a rapidly increasing environmental stress. The model output will determine the locations, sizes and timing of construction of new treatment plants plus an overall treatment plant operating policy so that environmental standards are maintained at a minimum cost. The model, as formulated, is a 0-1 mixed integer programming problem which is solved by decomposing it into a capital budgeting problem (solved by Little's branch and bound algorithm) and an operational policy problem (solved by linear programming). The coded algorithm (in FORTRAN 10) has been tested with a semi-realistic example. (Bell-Cornell)
W79-03425

ECONOMICS OF MINED LAND RECLAMATION AND LAND-USE PLANNING IN WESTERN STATES,
Argonne National Lab., IL.
For primary bibliographic entry see Field 6B.
W79-03433

SALT OUTFLOWS FROM NEW AND OLD IRRIGATION LANDS,
Snake River Conservation Research Center, Kimberly, ID.
For primary bibliographic entry see Field 3C.
W79-03442

THE BIOGEOCHEMISTRY OF HEAVY METALS IN POLLUTED LAKES AND STREAMS AT FLIN FLON, CANADA, AND A PROPOSED METHOD FOR LIMITING HEAVY-METAL POLLUTION OF NATURAL WATERS,
Fisheries and Marine Service, Winnipeg (Manitoba). Freshwater Inst.
For primary bibliographic entry see Field 5C.
W79-03449

REGISTRATION OF THIRTY-THREE FISHERY CHEMICALS: STATUS OF RESEARCH AND ESTIMATED COSTS OF REQUIRED CONTRACT STUDIES,
Fish and Wildlife Service, La Crosse, WI. Fish Control Lab.
R. A. Schnick, and F. P. Meyer.
Department of the Interior, Investigations in Fish Control No. 86, 1978, 19 p, 7 ref, 2 append.

Descriptors: *Research priorities, *Fish diseases, *Aquiculture, Monitoring, *Piscicides, *Lampricides, Collecting aids, Therapeutics, Disinfectants, Pond sterilants, *Herbicides, *Algicides, Anesthetics, Antimycin, Bayer 73, TFM, G-D-174, Rotenone, Squoxin, Thiamite, Betadine, Calcium hypochlorite, Formalin, Furanace, Furazolidone, Hyamine 1622, Lime, Malachite green, Masoten, Nitrofurazone, Potassium permanganate, Sulfadimethoxine, Sodium chloride, Ormetoprim, Sulfamerazine, Terramycin, Copper sulfate, 2,4-D, Dichlobenil, Diquat, Diuron, Endothall, Fenac, Silvex, Simazine, MS-222, Quinidine sulfate.

An estimated \$8.8 million for contract studies is needed to meet registration requirements for 33 chemicals now used or being considered for use in fish culture and management. Information given for each chemical includes its sponsor, current

registration status, research situation in six categories (toxicities to target and nontarget organisms, field testing, physiological studies, analytical methods development, counteraction, and mammalian safety determination), costs of required contract studies, and the prognosis for registration of the use of each compound. (EIS-Katz)
W79-03452

WATER + WEEDS + HEAT = NOVEL EXPERIMENTATION,
Beak Consultant Ltd., Calgary (Alberta).
J. Crosby-Diewold, and J. B. Raiton.
Canadian Water Resources Journal, Vol 3, No 3, p 62-77, 1978. 5 fig, 3 tab, 8 ref.

Descriptors: *Thermal powerplants, *Water quality standards, *Cooling water, *Thermal pollution, *Canada, Cooling, Thermal stress, Heated water, Water temperature, Effluents, Water pollution sources, Water pollution effects, Aquatic weeds, Aquatic weed control, Plant growth, *Thermal effluent, Elodea.

Two thermal power plants exist on the northern and southern shores of Lake Wabamun in central Alberta. A comparison of their respective cooling systems is given. The sequence of governmental decisions leading to the macrophyte studies is elaborated and some of the results are given. A generalized outline of environmental impacts is also given. Possible alternative modes of cooling and their respective capital and operating costs are discussed. (EIS-Deal)
W79-03456

USE OF 'BIOPOND SLUDGE' AS A FEED INGREDIENT FOR PEN-READED COHO SALMON,
Weyerhaeuser Co., Seattle, WA.
K. Rile, and B. Allee.

In: 26th Annual Northwest Fish Culture Conference, Dec 3-5, 1975, Otter Rock, Oregon, p 129-130, 2 tab, 1 ref.

Descriptors: *Aquaculture, *Water treatment, *Salmon, Growth, *Sludge, Sludge disposal, Fish culture, Protein, *Pulp and paper, Industry, *Pulp wastes, Fish diets, *Biopond sludge, Coho salmon, Fish establishment, Fish physiology.

The sludge from pulping processes is high in protein. The dried sludge was incorporated in diets for salmon. Preliminary observations show that fish will eat and grow on this diet and that further research is indicated. (EIA-Katz)
W79-03474

ACCLIMATION TEMPERATURE AND TEMPERATURE TOLERANCE IN FINGERLING LARGEMOUTH BASS (MICROPTERUS SALMOIDES),
North Texas State Univ., Denton. Dept. of Biological Sciences.

B. J. Venables, L. C. Fitzpatrick, and W. D. Pearson.
Environmental Pollution, Vol 17, p 161-165, 1978. 1 fig, 7 ref.

Descriptors: *Bass, *Heat resistance, *Thermal pollution, Water temperature, Heated water, Fry, Mortality, *Thermal powerplants, Fish physiology, Growth stages, Water pollution effects, Intakes.

Survival of test temperatures from 10 to 40°C (5°C intervals) was directly dependent on acclimation temperature for largemouth bass fingerlings which demonstrated 100% 48 h survival of instantaneous ambient temperature changes as great as 20°C. Direct mortality of fingerling bass due to power plant discharges seems unlikely. (EIS-Deal)
W79-03496

Field 6—WATER RESOURCES PLANNING

Group 6A—Techniques Of Planning

6. WATER RESOURCES PLANNING

6A. Techniques Of Planning

SOME LOCAL ECONOMIC IMPACTS OF THE MISSOURI RIVER RESERVOIRS WITHIN SOUTH DAKOTA (EFFECTS OF CONSTRUCTION, RECREATION, AND IRRIGATION AS REVEALED BY ANALYSIS OF SECONDARY DATA),

South Dakota State Univ., Brookings. Dept. of Economics.
For primary bibliographic entry see Field 6B.
W79-03001

STANDARDS RELATED TO WATER-ORIENTED AND WATER-ENHANCED RECREATION IN WATERSHEDS - PHASES II AND III,

Pennsylvania State Univ., University Park. Coll. of Health, Physical Education, and Recreation.
For primary bibliographic entry see Field 6B.
W79-03004

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS.

Texas Water Development Board, Austin.
For primary bibliographic entry see Field 6G.
W79-03043

OPTIMIZATION MODEL FOR THE EVALUATION OF FLOOD-CONTROL BENEFITS OF MULTIPURPOSE MULTIRESERVOIR SYSTEMS,

Texas Univ. at Center for Research in Water Resources.

D. T. Ford.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 638, Price codes A11 in paper copy, A01 in microfiche. Publication No 158, 1978. 247 p., 25 fig, 10 tab, 4 exch, 62 ref, 4 append. OWRT C-6268 (5224)(1).

Descriptors: *Flood control, *Economic evaluation, *Systems analysis. Estimated benefits, Reservoir storage, Reservoir releases, Reservoir operation, Multiple-purpose reservoirs, Water management(Applied), Frequency analysis, Optimization, Operations research, Network flow programming, *Arkansas River system.

A methodology is described for quantifying the demand for flood-control in a multipurpose reservoir system and for evaluating the expected benefits of satisfying that demand as a function of beginning-of-period storage, thereby permitting analysis of multipurpose operation with a suitably long computation interval. The methodology is executed in three major steps: (1) analysis of the frequency of natural flows and evaluation of the associated damages to develop damage frequency curves, (2) evaluation of the frequency of damages incurred by regulated flows for various states of system storage via application of an operation optimization model, and (3) integration of the resulting damage frequency curves to determine the expected flood-control benefits. The optimization model used is a linear programming model, formulated with emphasis on selection of operation rules that are acceptable in practice. Specific limitations imposed on flood-control operation of reservoirs by the Corps of Engineers are incorporated explicitly in this model, both as constraints and as terms of the objective function. Additional goals and priorities of operation are specified with penalty coefficients in the objective function. A special case of the linear programming model, the network flow programming model, is presented, and its application is discussed. The benefit evaluation methodology is demonstrated by application to reservoirs of the Arkansas River system. Additional applications of the benefit evaluation methodology and the operation optimization model are suggested. Modifications and improvements are proposed.
W79-03044

IMPACT OF HYDROLOGIC UNCERTAINTIES ON FLOOD INSURANCE,

Texas Univ. at Austin. Center for Research in Water Resources.

For primary bibliographic entry see Field 6F.
W79-03053

ANALYZING HYDROLOGIC UNCERTAINTY AND ITS IMPACT UPON DECISION MAKING IN WATER RESOURCES,

Princeton Univ., NJ. Dept. of Civil Engineering.
For primary bibliographic entry see Field 4A.
W79-03081

ASPECTS OF PRESENT HYDROLOGICAL AND WATER QUALITY MODELLING,

Karlsruhe Univ. (Germany, F.R.). Inst. fuer Siedlungswasserwirtschaft.

R. G. Cembrowicz, H. H. Hahn, E. J. Plate, and G. A. Schultz.
Ecological Modelling, Vol. 5, No. 1, p 39-66, June 1978. 8 fig, 3 tab, 37 ref.

Descriptors: *Model studies, Hydrology, *Water quality, *Optimization, *Simulation analysis, Systems analysis, Dynamic programming, Linear programming, Mixed-integer programming, Flow, Planning, Stochastic processes, Macro-elements.

Summarized is the 'state-of-the-art' of concepts and applications in the international development of water quality and hydrology modeling. Study information was obtained from publications, project reports, personal interviews, and discussions. Investigated were 41 models from 11 different countries, 20 emphasizing hydrological aspects, 18 focussing on water quality, and 3 incorporating both hydrology and quality. Established were general principles of model analysis for comparison and presentation. So-called 'macro-elements', comprising input, systems analysis formulation, algorithm, and output were identified. 'Micro-elements' were defined, denoting typical analytical units within the models. Part A of the report focuses on hydrological models; introduced were three model classes, according to purpose, data requirements, and model structures, viz.: computation of runoff data; optimal operation of regional water resources systems; and optimization of the design of hydraulic structures. In part B, focussing on water quality, the more traditional approach of a descriptive analysis of the self-purification process in rivers were explored in several directions. Considered were: data fitting of lump-sum observations; detailed empirical formulation of processes; food-chain simulation; and stochastic water quality analysis. Formal optimization routines employed in quality control emphasize linear, mixed-integer, and dynamic programming, the trend showing a desirable feedback between optimization and simulation. Mathematical modeling of hydrological and water quality phenomena has become an indispensable tool for environmental control and enhancement. (Bell-Cornell)

W79-03088

INTER-DISTRICT WATER ALLOCATIONS VIA LINEAR PROGRAMMING AND LINEAR PROGRAMMING DECOMPOSITION,

Iowa Univ., Iowa City. Inst. of Hydraulic Research.

For primary bibliographic entry see Field 4A.
W79-03091

A NONLINEAR PROGRAMMING ALGORITHM FOR REAL-TIME HOURLY RESERVOIR OPERATIONS,

California Univ., Los Angeles. Dept. of Engineering Systems.

For primary bibliographic entry see Field 4A.
W79-03093

OPTIMAL PLANNING FOR URBAN STORM DRAINAGE SYSTEMS,

Purdue Univ., Lafayette, IN. School of Civil Engineering.

S. A. Dendrou, J. J. Talavage, and J. W. Delleur.
Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers. Vol 104, No. WRI-November 1978. p 17-33, 5 fig, 2 tab, 16 ref, append. OWRT B-083-IND (9).

Descriptors: *Urban drainage, *Drainage systems, *Storm drains, Storm runoff, Urban hydrology, *City planning, *Optimal development plans, *Indiana, LANDSTORM, URBDRAIN, LANDUSE, *Optimization.

A watershed in an urban area may be partitioned into subbasins, each of which is a tributary to a downstream subbasin or to a receiving water body. The planning of a storm drainage system for such a watershed according to the requirements of Section 208, PL 92-500, can be efficiently accomplished by coordination of the interactions among the subbasins. A model for these interactions is presented and implemented in the urban storm drainage planning model URBDRAIN. The planning variables in the model are maximum convey-

Evaluation Process—Group 6B

ing capacities of the drainage network, placement and size of detention storage facilities, and size of a central treatment facility. A two-level optimization solution procedure is shown which provides minimal-cost values for the planning variables. An example application is shown for a medium size community in Indiana.

W79-03107

PLANNING STORM-DRAINAGE SYSTEMS FOR URBAN GROWTH,
Purdue Univ., Lafayette, IN. School of Civil Engineering.

S. Dendrou, J. W. Delleur, and J. J. Talavage. Journal of the Water Resources Planning and Management Division, Proceedings of the American Society of Civil Engineers. Vol 104, No. WRI, Nov. 1978, 16 p, 10 fig, 19 ref. OWRT B-083-IND (8).

Descriptors: *Land use, *Runoff, *Storm runoff, *Urban drainage, Floods, *Planning, *Indiana, Landuse, Storm, Landstorm, Growth projections.

A package is developed that integrates and interfaces an urban growth simulation model and an urban hydrology model, so as to explicitly evaluate the effectiveness of nonstructural measures, e.g., zoning as far as the drainage system is concerned. Alternate growth scenarios can thus be directly related to the corresponding storm-drainage systems of specified standards of performance. Among the remaining 'Best Management Practice' control options, the on-site storage, treatment and controlled overflow are retained as accurately representing the facets of urban stormwater management relevant at the planning stage. This is achieved by including these controls in a simulation of the hydrologic behavior of each local drainage basin of an urban agglomeration separately. An application is given for a medium size community in Indiana.

W79-03108

SYSTEMATIC PLANNING OF URBAN STORM-DRAINAGE UTILITIES,
Purdue Univ., Lafayette, IN. School of Civil Engineering.

S. A. Dendrou, J. W. Delleur, and J. J. Talavage. In: International Symposium on Urban Storm Water Management. University of Kentucky, Lexington, Kentucky. July 24-27, 1978. p. 229-234, 5 fig, 1 tab, 7 ref. OWRT B-083-IND (7).

Descriptors: *Urban drainage, *Urban runoff, *Land use, Storm water, Storm runoff, *Community development, Drainage systems, Urban hydrology, Planning, *City planning, *Computer programs, Model studies, Urban growth, Landuse, Storm.

A computer program package is developed that integrates and interfaces an urban growth simulation model, LANDUSE, and an urban hydrology model, a modified version of STORM. Alternate growth scenarios can thus be directly related to the corresponding storm-drainage systems. If these systems are designed to achieve specified standards of performance, then useful comparison among several possible urban growth patterns can be performed. While an urban area encompasses several natural watersheds, the hydrologic models simulate one watershed at a time. The different watersheds that partition an urban agglomeration create a tree-like or dendriform configuration. The planning of a global storm drainage system for such a conglomerate of basin can be efficiently accomplished by a coordination of the interactions among the different basins. A model for these interactions is developed. The planning variables are the drainage network capacity, the placement and size of the storage facilities, and the size of a central treatment facility. An example of application is shown for a medium size community in Indiana.

W79-03109

USERS MANUAL FOR LPTOR - A FORTRAN IV LINEAR PROGRAMMING ROUTINE,

Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
For primary bibliographic entry see Field 7C.
W79-03123

A NEW APPROACH TO URBAN WATER RESOURCES SYSTEMS OPTIMIZATION,
Illinois Univ. at Urbana-Champaign. Hydrosystems Lab.

D. R. Maidment, and V. T. Chow. In: The Environment of Human Settlements: Human Well-being in Cities, Proceedings of the Conference held in Brussels, Belgium, April 1976, p. 249-259, 1976. 3 fig, 26 ref, Pergamon Press, England. OWRT B-084-ILL(3), 14-31-0001-4080.

Descriptors: *Optimization, Planning, Operations research, Systems analysis, Model studies, *Urban water resources systems, Urban population.

The modern concept of urban water resources planning is to formulate the problems as hydroeconomic systems and then to optimize the systems using operations research techniques. A new approach to this optimization based on state variables is developed for urban water resources systems. The application of this approach to urban hydrologic problems is outlined and illustrated with an example. The incorporation of state variable models of the systems into procedures for determining the design and operational policies for urban water facilities is discussed.

W79-03124

RESIDUALS MANAGEMENT PRIORITIES FOR THE MONONGAHELA RIVER BASIN,
Resource Planning Associates, Inc., Washington, DC.

For primary bibliographic entry see Field 5G.
W79-03146

SPILL RISK ANALYSIS PROGRAM: METHODOLOGY DEVELOPMENT AND DEMONSTRATION, FINAL REPORT,
ORI, Inc., Silver Spring, MD.

For primary bibliographic entry see Field 5G.
W79-03148

ENVIRONMENTAL RESOURCES MANAGEMENT STUDIES OF THE KISSIMMEE RIVER BASIN,
Florida Univ., Gainesville. Dept. of Environmental Engineering Sciences.

For primary bibliographic entry see Field 5G.
W79-03150

DATA-INTENSIVE SPATIAL SAMPLING AND MULTIPLE HIERARCHICAL CLUSTERING: METHODOLOGICAL APPROACHES TOWARD COST/TIME EFFICIENCY IN NATURAL RESOURCE ASSESSMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.

A. F. Frondorf, M. M. McCarthy, and W. O. Rasmussen. Landscape Planning, Vol. 5, No. 1, p. 1-25, 1978. 11 fig, 17 ref. National Park Service Grant PX 810060108.

Descriptors: *Sampling, *Spatial distribution, *Methodology, *Rhyolite Canyon Watershed(AZ), *Cluster analysis, *Resource management, Analytical techniques, Natural resources, Arizona, Chiricahua National Monument(AZ), National Monuments, Computer programs, Forecasting, Decision making, Planning, Computer models, Model studies, Baseline studies, Cost-effectiveness, Economic efficiency, Dendograms.

Data-intensive sampling and multiple simultaneous hierarchical cluster analyses were combined into a total methodology to develop a computerized natural resources information system for the Rhyolite Canyon watershed, later to be extended to the entire Chiricahua National Monument, Arizona. The system predicts consequences of management decisions on the resource base. The method relies

on existing computer software capabilities, and represents a significant breakthrough in cost/time efficiency in the production of an operational natural resource data base. Although total costs, man-hours, and computer time are reduced to a minimum, the system produces two- and three-dimensional computer graphic displays representing several hundred individual pieces of natural resource information. The clustering program CLUSTAN was chosen for the cluster analyses. The polythetic agglomerative strategy of clustering joins individuals or groups together (agglomerative) on the basis of their similarity among several variables (polythetic). Results are displayed in the form of dendograms, with individuals arrayed along the horizontal axis and similarity decreases on the vertical axis. Dendrogram interpretation showed elevation, slope, and vegetation type and density to be 'indicator' data types, with all remaining data types linked to these four, the only ones entered and stored. Costs and time are economized, while sacrificing neither accuracy nor specificity. (Lynch-Wisconsin)
W79-03188

USER'S MANUAL FOR OPTOR - A FORTRAN IV QUADRATIC PROGRAMMING ROUTINE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

For primary bibliographic entry see Field 7C.
W79-03271

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,

Instituto Venezolano de Investigaciones Científicas, Caracas. Lab. de Ingeniería Ambiental.
For primary bibliographic entry see Field 5G.
W79-03425

6B. Evaluation Process**SOME LOCAL ECONOMIC IMPACTS OF THE MISSOURI RIVER RESERVOIRS WITHIN SOUTH DAKOTA (EFFECTS OF CONSTRUCTION, RECREATION, AND IRRIGATION AS REVEALED BY ANALYSIS OF SECONDARY DATA),**

South Dakota State Univ., Brookings. Dept. of Economics.
R. L. Vertrees.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 752, Price codes: A99 in paper copy, A01 in microfiche. Water Resources Institute, South Pacific University. Completion report, December 1978. 624 p, 22 fig, 76 tab, 13 append. OWRT B-025-SDAK(1). 14-01-0001-3648.

Descriptors: *Irrigation, *Recreation, *Economic impact, *River basin development, Social impact, Employment, Population, Income, *South Dakota, *Missouri River, Reservoirs, Dam construction.

Information is provided about local economic impacts that resulted from construction of the four mainstem dams along the Missouri River within South Dakota and that have been brought about within the state by recreational and irrigation uses of reservoirs impounded by these dams. Findings are based upon analyses of data obtained from published sources and agency records. Economic impacts were estimated upon selected counties adjacent to the reservoirs, separate reservoir regions, and upon the entire reservoir region. The type of impacts studied were: effect upon population levels, total personal income, per capita income, personal income received by employees within specific industries or sectors and the number of employees and establishments within these industries or sectors. (Wiersms-South Dakota)
W79-03001

STANDARDS RELATED TO WATER-ORIENTED AND WATER-ENHANCED RECREATION IN WATERSHEDS - PHASES II AND III,
Pennsylvania State Univ., University Park. Coll. of

Field 6—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

Health, Physical Education, and Recreation.

B. van der Smissen, and M. L. Christiansen.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 771, Price codes: A11 in paper copy, A01 in microfiche. Institute for Research on Land and Water Resources, Pennsylvania State University, Research Publication 101, October 1978. 246 p, 4 fig, 4 tab, 668 ref, 2 append. OWRT A-033-PA(2). 14-31-0001-5038.

Descriptors: *Standards, *Recreation, *Pennsylvania, *Watersheds(Basins), Land use, Surface waters, Vegetation, Meteorological data, Wildlife, *Outdoor recreation planning, *Recreation activities, Kinetic recreation, Harvest recreation, Beach swimming, Family camping.

In Phase II a typology of activities was developed which included three major divisions: kinetic recreation, situation-oriented recreation, and 'harvest' recreation. Each of the three divisions has been subdivided into three categories with primary orientation of land, water, or air, but with the situation-oriented division also having an educational enhancement category. Also, as part of the typology phase of the study, characteristics of users and classification of activities by characteristics and by nature of user experiences have been identified and synthesized. A conceptual model for planning purposes based on the development of resource requirements determinants for selected activities was structured in Phase III. A resource descriptor classification system was established. It was structured around commonly accepted significant conditions and supplemented with additional natural conditions considered important. The master list of descriptors included 77 descriptors divided into five categories: land, surface water, vegetation, meteorological, and wildlife descriptors. The model was tested for beach swimming at four Pennsylvania State Parks and for family camping at two. An activity analysis of the two activities as well as the details on the indicators of land-use capabilities are presented. (See also W77-05484) (Sink-Penn State) W79-03004

EVALUATION OF ALTERNATIVE STORM-WATER MANAGEMENT POLICIES,

Maryland Univ., College Park. Dept. of Civil Engineering.

R. H. McCuen, and G. E. Kamedulski.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 736, Price codes: A02 in paper copy, A01 in microfiche. Water Resources Research Center, University of Maryland, Technical Report No 50, October 1978. 12 p, 6 tab. OWRT A-047-MD(1). 14-34-0001-8022.

Descriptors: *Stormwater management, Detention storage, Urban hydrology, *Evaluation, Water quality, Sediment control, *Alternative planning, *Water policy, Storm runoff.

Stormwater management is recognized as a requisite to controlling storm runoff from developing areas. To best meet societal needs, numerous policies have been adopted to meet the intent of stormwater management. Unfortunately, many policies are deficient in their failure both to lead to designs that meet the intent of stormwater management and to provide the proper guidelines for translating policy into design that provides the maximum benefit to society. Specific deficiencies of many policies include: (1) the use of a single frequency; (2) neglect of storm duration; (3) inadequate consideration of maintenance; (4) insensitivity to the importance of soil characteristics; (5) lack of recognition of differences between water quantity and quality control; and (6) lack of consideration of downstream effects of detention storage. The effects of these policy deficiencies were evaluated. W79-03039

OPTIMIZATION MODEL FOR THE EVALUATION OF FLOOD-CONTROL BENEFITS OF MULTIPURPOSE MULTIRESERVOIR SYSTEMS,

Texas Univ. at Center for Research in Water Resources.

For primary bibliographic entry see Field 6A.

W79-03044

SOME THEORETICAL AND MEASUREMENT ISSUES IN ECONOMIC ASSESSMENT OF INTERBASIN WATER TRANSFERS,

California Univ., Berkeley.

A. C. Fisher.

Water Supply and Management, Vol. 2, No. 2, p 137-145, 1978. 10 ref.

Descriptors: *Economics, *Assessment, *Interbasin transfer, *Water resources, *Environmental effects, *Cost-benefit analysis, Regional analysis, Systems analysis, Equations, Impact analysis, Environmental costs, Uncertainty, Irreversibility, Sequential model, Investment.

Tremendous increases in the size and cost of recently proposed interbasin water transfers (IWT's) necessitate careful consideration of their economics. Offered are critical remarks concerning concepts and measurement techniques for assessing the costs and benefits of IWT's. The remarks fall into three categories: (1) methods of measuring conventional economic costs and benefits; (2) the introduction of environmental effects; and (3) special problems posed by the very long-lasting and uncertain consequences—including those to the environment—of the IWT projects. The current 'best practice technology' for assessing the impact of an IWT on a region's economy is input-output analysis. This method does not represent an advance over simpler alternative methods of regional impact analysis. Proposed is the use of an econometric modeling technique that can account—as input-output analysis does not—for both changes in the structure of the impacted region's economy and the time periods required for these changes to work themselves out. However, an IWT is virtually certain to have an impact—quite possibly adverse—on the environment that is not reflected even in the most sophisticated econometric analysis. Discussed is how the impact can, in principle, be incorporated into the benefit-cost analysis. Moreover, very long time spans and problems of uncertainty are not tractable to conventional benefit-cost analysis. The interaction between uncertainty and irreversibility (of a project's effects) have some rather sharp qualitative implications for policy. It is difficult to make any quantitative assessment of the 'option value' of deferring. (Bell-Cornell) W79-03140

For primary bibliographic entry see Field 6A.

ANALYZING HYDROLOGIC UNCERTAINTY AND ITS IMPACT UPON DECISION MAKING IN WATER RESOURCES,

Princeton Univ., NJ. Dept. of Civil Engineering.

W79-03081

DEMAND, SUPPLY, AND ECONOMIC EFFICIENCY,

Maryland Univ., College Park.

For primary bibliographic entry see Field 6D.

W79-03084

PLANNING IN SMALL- AND MEDIUM-SIZE ILLINOIS MUNICIPAL WATER SYSTEMS,

Illinois Univ. at Urbana-Champaign.

For primary bibliographic entry see Field 3D.

W79-03097

ALTERNATIVES FOR MANAGING A FINITE GROUNDWATER SUPPLY IN AN ARID REGION,

Arizona Univ., Tucson. Office of Arid Lands Studies.

For primary bibliographic entry see Field 4B.

W79-03131

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY,

Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.

G. Aron, and S. P. Coelen.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A045 105. Submitted to U.S. Engineering Institute for Water Resources, Fort Belvoir, VA, IWR Contract Report 77-4, July 1977. 198 p, 32 fig, 23 tab. DACW31-75-C-0018.

Descriptors: *Water supply, *Marginal costs, *Average costs, *Water supply development, *Inter-basin transfers, *Regional development, *Regional water supply, *Regionalization, Water Reservoir yield, Water resources, Reservoir storage, Economics of scale, High flow skimming, Reservoir enlargement, Time series analysis.

This report seeks to evaluate the belief that regionalization of water supply in the U.S. is a key factor in solving problems of water supply and waste treatment. A brief history of regionalization attempts in the U.S. and causes for failure are discussed. Most regionalization plans have failed both because of political and institutional constraints and because problems of efficiency and equity were not resolved. The feasibility of regionalization of water supply and waste disposal systems is then discussed. The report examines economies of scale with respect to storage reservoirs, treatment facilities, well construction, transmission pipeline construction, pumping operations, and others. Cost curves are presented for all operations, but only storage reservoirs and treatment facilities offered any kind of economy of scale. The Centre Region around State College, PA was chosen as a case study site for the micro-scale study phase, and a comparison of costs of local versus regionalized water supply systems was conducted. Methodological tools were developed for estimating firm yields from reservoirs and expected shortages given long-term average streamflow and specific water demand for local and regional water systems. A critical look is taken at interbasin water transfer and its problems. It is concluded that there is little economy of scale when water supplies are developed from groundwater sources. Also, any given water supply (sewage) project can produce distributional consequences which may cause rejection of regional plans. (Coan-NC)

W79-03140

SUSQUEHANNA RIVER BASIN STUDY: SUMMARY.

Susquehanna River Basin Study Coordinating Committee.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 890, Price codes: A08 in paper copy, A01 in microfiche. June 1970. 168 p, 27 tab, 56 fig. See also Supplements A and B.

Descriptors: *Comprehensive planning, *Water resources development, *River basin development, *Susquehanna River, Chesapeake Bay, Land resources, Land management, Watershed management, Recreation, Water supply, Water quality, Flood control, Short-term planning, Long-term planning, Administration, Coordination, Legislation, Political aspects, Governments, Economic efficiency, Investment, Economic justification, Economic impacts, Water policy, Needs assessment, Implementation.

This volume is a summary of the comprehensive plan for the development of water and related land resources of the Susquehanna River Basin. The objectives of the study were to evaluate the water resources potential of the basin, to determine the water resource requirements of an increasing population, to analyze alternative solutions, to recommend management programs and to preserve the high natural values of the basin for the use of present and future generations. In the first chapter, the basin's needs are outlined: water quality, recreation, water supply, flood control, land management, electric power, streambank stabilization and erosion control. The plan for the Susquehanna is reviewed, implementation suggestions are presented and policy recommendations made. The second chapter deals with the basin's environment—the physical and human landscapes and man's impact on the basin's water and land resources. Exactly how the plan will affect the four major needs of

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WATER RESOURCES PLANNING—Field 6

Evaluation Process—Group 6B

water quality, recreation, water supply and flood control is then assessed. The planning background is developed, plan formulation reviewed and public involvement addressed. Both an early action plan and a framework plan were developed; the former looks to the conservation and development of the basin's resources with a 10-year horizon, and the latter looks at long-range requirements and opportunities, reaching to the year 2020. Adequacy and effects of the plan as they affect the four major needs of the basin are then addressed. A final chapter looks at putting framework plan, investment analysis and priorities and policy and legislative recommendations. (See also W79-03143 and W79-03144) (Zayac-NC)
W79-03142

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT A—PLAN FORMULATION.

Susquehanna River Basin Study Coordinating Committee.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 888, Price codes: A12 in paper copy, A01 in microfiche. June 1970. 265 p, 28 fig, 22 tab. See also Summary and Supplement B.

Descriptors: *Water resources development, *River basin development, *Comprehensive planning, *Watershed management, *Susquehanna River, Land resources, Land management, Chesapeake Bay, Administration, Coordination, Multiple-purpose projects, Economic efficiency, Benefits, Costs, Investment, Economic impact, Economic justification, Regional analysis, Alternative planning, Long-term planning, Short-term planning, Institutions, Environmental effects, Governments, Recreation, Public participation, Pollution abatement, Flood damage reduction, Electric power, Navigation, Streambank stabilization.

The objective of this Supplement A to the Main Report is the formulation of a comprehensive plan for the development of water and related land resources of the Susquehanna River Basin. Existing and presently programmed development is inventoried for a number of items: municipal, industrial and agricultural water supply; general outdoor recreation; fish and wildlife; pollution abatement; flood damage reduction; streambank stabilization; electric power; navigation; and the Chesapeake Bay. An investigation is conducted as to whether a pattern of problems can be determined; the feasibility of systematic analysis is explored. The plan formulation workshop approach is outlined, objectives are defined and criteria for formulation developed. A formulation procedure is set up, alternative solutions generated, and the alternatives are screened. Base plan measures are selected. The alternatives are studied by objectives; these include economic efficiency, regional development, environmental quality and multiple-objective formulation. Critical choices among alternatives are identified as these alternatives apply to four different sub-basins—the Upper Susquehanna Basin in New York, the Chemung River Basin, Conodoguinet Creek and Codorus Creek—and the Susquehanna River Basin and Chesapeake Bay. The public influence in the planning process is assessed; local planning meetings and public forums are described. (See also W79-03142) (Zayac-NC)
W79-03143

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT B—PROGRAM SUMMARY.

Susquehanna River Basin Study Coordinating Committee.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A043 889, Price codes: A09 in paper copy, A01 in microfiche. June 1970. 194 p, 48 tab, 47 fig. See also Summary and Supplement A.

Descriptors: *Programs, *Land management, *Watershed management, *Water resources development, *River basin development, *Susquehanna River, Chesapeake Bay, Project planning, Long-term planning, Short-term planning, Comprehensive planning, Structures, Land development, Water quality management, Land resources, Non-

structural alternatives, Land use, Regulation, Federal government, Water quality, Multiple-purpose reservoirs, Recreation, Fisheries, Water supply, Flood control, Structural measures.

This Supplement B is intended to reinforce the Summary Report by providing more detailed information on the Summary's recommendation. The study was undertaken to provide a comprehensive plan for the development of water and related land resources of the Susquehanna River Basin. In this volume, particular attention is given to the Plan in each of eight hydrologic sub-basins identified in the study, the intent being to make information more accessible at the local and regional level. Each sub-basin is discussed in detail. Its water requirements are inventoried. Short-term recommendations are presented in the form of an Early Action Plan; long-term recommendations are presented in subsequent discussion of the Framework Plan. Alternatives to structural measures are then recommended. Following the description of the Plan by sub-basin, a final chapter suggests means to implement it, including general recommendations for the relative share of the costs between Federal and non-Federal interests. Structural and management measures are discussed. Under structural measures, water quality management, major multiple purpose dams and reservoirs, reservoirs for recreation and fishing habitat, groundwater and pipelines for municipal and industrial water supply, local flood protection projects and upstream watershed projects are reviewed. Under management measures, land and stream management are assessed. (See also W79-03142) (Zayac-NC)
W79-03144

ENVIRONMENTAL POLLUTION CONTROL: TWO VIEWS FROM THE GENERAL POPULATION.

Kansas State Univ., Manhattan. Dept. of Political Science.

For primary bibliographic entry see Field 5G.
W79-03154

THE PUBLIC DECIDES ABOUT WEATHER MODIFICATION.

Colorado Univ., Boulder. Human Ecology Research Services.

For primary bibliographic entry see Field 3B.
W79-03155

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY. VOLUME I: MAIN REPORT.

Army Engineer District, St. Louis, MO.
Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 824, Price codes: A13 in paper copy, A01 in microfiche. January 1964. 220 p, 62 tab, 26 fig, 8 plates, attachment.

Descriptors: *Water resources, *Water resources development, *Flood control, *Flow augmentation, *Planning, *Meramec River(MO), Missouri, Water supply development, Multiple-purpose reservoirs, Watershed management, Water quality, Recreation, Fish management, Wildlife management, Economics, Cost-benefit analysis, Coordination, Structural alternatives, Economic justification, River basin development, Plan implementation.

The study's objective is to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. The flow of the Meramec River is extremely variable—low flows in the summer are insufficient to provide adequate waste dilution, while flooding at other times is quite destructive. The plan presented for the Basin consists of seven main stem reservoirs, 12 tributary stream reservoirs, 12 headwater reservoirs, 26 angler-use sites and nine local protection projects. The plan will provide: flood control equal to standard project flood protection in the lower basin with upper basin protection against floods of 10- to 15-year frequencies; water quality control and supplemental water supply requirements to the year 2020; practicable recreation and

fish and wildlife development; and economic improvement in the upper basin. Hydroelectric possibilities are reviewed and possibilities are retained for further consideration. Recommendations for implementation and coordination are provided; costs are estimated. Detailed considerations of the suggested structural projects are presented. The general outline of the report follows: basin description; present economic development; existing projects and improvements; projected economic growth and related water resource problems; plan formulation; detailed descriptions of the proposed improvements; estimates of first costs and annual charges; estimates of benefits; economic justification; apportionment of costs; coordination with other agencies; local cooperation; and plan implementation. (See W79-03165 thru W79-03172) (Zayac-NC)
W79-03164

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME II, APPENDIX A: THE ECONOMY AND CHARACTER OF THE MERAMEC.

Washington Univ., St. Louis, MO.

E. L. Ullman, R. R. Boyce, D. J. Volk, R. C.

Smith, and F. Miller.

December 1961, 266 p, 6 chapters.

Descriptors: *Water resources development, *Industries, *Mining, *Recreation, *Land use, *Agriculture, *Population, Missouri, Economic impact, Industrial production, Industrial plants, Mining engineering, Geology, Mineral industry, Environmental effects, Aesthetics, Recreation demand, Recreation facilities, Land management, Land development, Soil conservation, Farms, Cropland, Employment, Income, Forestry, *Meramec River(MO), Urban-industrial distribution, Economic development.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. Appendix A deals with the economy and character of the study area. No summary is provided as the volume is comprised of six distinct chapters. The first chapter on location, population and development begins with a discussion of terrain, climate and forest cover. Employment and income are reviewed, as is transportation and its relation to the St. Louis metropolitan area. Recent trends in population are outlined as baseline data for projections and predictions. Economic development and education are discussed. Chapter 2 has two parts: physical land conditions and agricultural conditions and trends. In Part 1, a review of land characteristics and capabilities is followed by a review of land use and conservation. Part 2 outlines characteristics of land and farms, trends in acreage of principal crops, crop yields and farms income. Chapter 3 on forestry inventories the Meramec Basin forest resource, reviews factors that affect timber growing, lists timber products and industries and projects the forest future. Chapter 4 is concerned with recreation and scenic resources, summarizing the historical and present recreation in the Basin and projecting future recreational opportunities. Chapter 5 is a report on mining. In Part 1, rock and mineral commodities are outlined, including geology and metallic and non-metallic commodities; Part 2 discusses future possibilities: new mineral developments and prospects for nearby steel production. Chapter 6 deals with towns, industry and trade. Here, the primary areas of emphasis are urban-industrial distribution patterns, industrial competition and the dilemma of industrial promotion. (See also W79-03164)
W79-03165

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME III, APPENDIX B: WATER NEEDS AND PROBLEMS.

Washington Univ., St. Louis, MO.

For primary bibliographic entry see Field 5G.
W79-03166

Field 6—WATER RESOURCES PLANNING

Group 6B—Evaluation Process

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME IV, APPENDIX C: HYDROLOGY; APPENDIX D: GEOLOGY, SOILS AND MATERIALS.

Army Engineer District, St. Louis, MO.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-036 827, Price codes: A14 in paper copy, A01 in microfiche. January 1964. 308 p.

Descriptors: Hydrology, *Soils, *Geology, *Construction materials, *Meramec River(MO), Missouri, Hydrologic data, Hydrologic aspects, Hydrologic cycle, Hydrologic systems, Geohydrological units, Synthetic hydrology, Evaporation, Groundwater, Precipitation(Atmospheric), Rainfall, Running waters, Snowfall, Soil water, Runoff, Geologic units, Geologic formations, Engineering geology, Geomorphology, Glaciology, Mineralogy, Physiographic provinces, Materials engineering, Soil types, Soil engineering, Soil groups, Soil properties.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet short- and long-term needs. This volume is comprised of two appendices. App. C contains hydrologic, hydraulic and water resource data important to the basin-wide plan for the Meramec River. A detailed description of precipitation patterns follows a quick overview of the basin's general climatological features. Annual, seasonal, abnormal, and subnormal precipitation, annual snowfall and rainfall intensity data, are presented. The magnitude and frequency of floods are developed, stream flow data are presented, and yields are estimated. Water supply demands for various uses are noted, and evaluations made as to how these demands can be met by projects considered in the study. Flood control benefit analysis uses hydrologic data developed in this appendix. The purpose of App. D is to present all geologic data that might influence engineering and economic feasibilities of the study's proposed projects. Physiography is reviewed in terms of topography, drainage and geomorphology. General geology of the basin is discussed through an investigation of the geological aspects and mineral resources of the sub-basins, stratigraphic succession, surface rock and groundwater characteristics. The geology of each proposed main stream, tributary and headwater reservoir is outlined. Soil data and the availability of construction materials reviews close out the appendix. (See also W79-03164) (Zayac-NC) W79-03167

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME V. APPENDIX E: PROJECT DESIGNS AND COST ESTIMATES; APPENDIX F: HYDROPOWER.

Army Engineer District, St. Louis, MO.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 696, Price codes: A14 in paper copy, A01 in microfiche. January 1964, 316 p.

Descriptors: *Project feasibility, *Project planning, *Water resources development, *Hydroelectric plants, Missouri, Design, Project purposes, Project life, Sites, Multiple-purpose reservoirs, Economics, Cost allocation, Relocation, Electrical design, Bores, Hydroelectric power, Cost analysis, Planning, Coordination, Pumped storage, Foundation investigations, Economics, *Meramec River(MO), Land requirements, Conventional power, Discharge data, Head data.

The Meramec River comprehensive basin study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. Volume V is comprised of two appendices. Appendix E contains the design and cost estimates of the physical features of each proposed element of the recommended comprehensive plan for development of water resources of the Meramec River Basin. A description of each of the seven main stream reservoirs, of the 12 tributary reservoirs, and of the 12 headwater reservoirs is provided. Angler-use sites and local protection projects are

described. In each of these descriptions, location, design detail, electrical features, borings, relocations and alterations, land requirements and cost estimates are discussed. Appendix F studies hydro-power, its design details, cost estimates, economics and plans. Coordination with the Federal Power Commission and the Southwestern Power Administration is outlined. Conventional power, pumped storage and conventional plant alternatives are weighed. Three facilities are evaluated: Meramec Park, Pine Ford, and Salem. For each, head and discharge data, design details and foundation investigations are presented. Cost estimates follow, and an economic analysis ends the report. (See also W79-03164) (Zayac-NC) W79-03168

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VI. APPENDICES G THROUGH L.

Army Engineer District, St. Louis, MO.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 697, Price codes: A13 in paper copy, A01 in microfiche. January 1964, 296 p.

Descriptors: *Planning, *Water resources development, *Land use, *Reservoirs, *Forest management, *Mineral industry, *Groundwater resources, *Water resources, Missouri, Land resources, Land appraisals, Land classification, Land management, Hydrology, Hydraulics, Hydraulic engineering, Forest soils, Forestry, Watershed management, Mining, Groundwater availability, Groundwater basins, Groundwater movement, Groundwater potential, Groundwater recharge, Water supply, Water quality, *Meramec River(MO), *Mineral resources.

This study was undertaken to devise a program for development of the Meramec Basin's water and related land resources to meet short- and long-term needs. Vol. VI contains 6 appendices. App. G has two parts: Part 1, Physical Land Condition, and Part 2, Design and Cost Estimates for Headwater Reservoirs. Part 1 assesses basin geology and soils, then presents a resource area map. A land use capability classification system is presented, followed by a more extended discussion of land use and conservation measures. Part 2 reviews the geology of the headwater reservoir sites, then outlines hydrologic, hydraulic and engineering investigations of the sites. App. H is a Plan of Participation by the USDA. It outlines departmental planning objectives, the principal features of the USDA study and the scope and responsibilities of USDA agencies. App. I is a Report on Forest Resources Potential. Present and future resources are assessed, as are present and future possibilities of markets for these forestry resources. Impacts and contributions of the resources are reviewed by looking at demands and benefits according to the local economy in terms of employment and increased income. App. J—Mineral Resources and Mineral Industry—analyzes the mineral resources of the basin. A section on refractory clays in the basin looks at clay typology and the clay industry. Iron and lead deposits and stone and gravel are reviewed. App. K—Groundwater Use and Production Capabilities—evaluates groundwater use and potential. App. L—a Water Resources Study—is a preliminary evaluation of the need for and value of storage for municipal and industrial water supply and water quality control in the basin. Projects are described, present water use is outlined, and future water requirements are reviewed. (See also W79-03164) (Zayac-NC) W79-03170

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VIII. APPENDIX T: DETAILED COST ESTIMATES.

Army Engineer District, St. Louis, MO.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 699, Price codes: A14 in paper copy, A01 in microfiche. January 1964, 327 p, 60 tab.

Descriptors: *Multiple-purpose reservoirs, *Water resources development, *Cost analysis, Missouri, Cost allocation, Economics, Construction costs, Cost-benefit analysis, Cost comparisons, Unit costs, Cost repayment, Benefits, Costs, Low-flow augmentation, Water quality, Water supply, Recreation, Flood control, Conservation, *Meramec River(MO), Economic development.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. Appendix T first reviews in a general fashion the bases of design and ways of estimating costs. Basis of design for reservoirs, local protection projects and angler-use sites are summarized from detailed design considerations presented in Appendix E. These design requirements then serve as a basis for very precise cost estimates. Plans for individual reservoirs were considered on a multiple-purpose basis; attention was given to low-flow augmentation, water quality control, water supply, recreation, economic development, conservation and flood control. Costs were allocated on the basis of costs developed in this appendix, and the benefits contained in Appendix R were used to develop benefit-cost ratios for each purpose in each reservoir. The cost estimates for the various elements contained in the comprehensive basin plan are divided into three separate parts: cost estimates for

management, *Wildlife management, *Caves, *Flood control, *Benefits, *Meramec River(MO), Missouri, Recreation demand, Recreation facilities, Reservoir operation, Impoundment, Surface waters, Reservoir storage, Water sources, Water supply, Forest management, Fish populations, Fish conservation, Wildlife conservation, Wildlife, Economics, Flood damage, Flood plains, Flood protection, Floods, Cost-benefits analysis, Estimated benefits, Public opinion, Citizen participation.

This study was undertaken to devise a program for development of the Meramec Basin's water and related land resources to meet short- and long-term needs. This volume contains 7 appendices related to components of the proposed plan. App. M—Recreation Needs Related to Reservoirs—evaluates recreational needs, reviews present status of water-based recreational opportunities and shows that water as a recreation resource is available only in streams or rivers. An attempt is made to analyze recreation demand once reservoirs are in place. App. N—Multiple Use Survey—considers the impacts of the proposed basin project on the Clark National Forest and non-Federal lands. Facilities, services, resources and uses that will be affected are described. App. O—Effect on Fish and Wildlife—reviews present status of fish and wildlife resources, and discusses the effects on these resources once the project is implemented. Benefits and costs resulting from implementation are analyzed and recommendations concerning specific project lands and waters are made. App. P—Effect on Caves—discusses the effects of the proposed reservoir system on the principal caves which are major attractions on the area. No deleterious effect will be suffered other than flooding of the lower level of one cave. App. Q—Studies Flood Control Economics. Present conditions of flood plain development and flood damages are outlined with and without implementation of the proposed plan. App. R—Evaluation of Benefits—explains the derivation of benefits attributable to the proposed plan. Reservoir benefits for flood control, water quality, water supply, and others are enumerated. Area reorientation benefits are studied; negative benefits are reviewed. App. S—Digest of Public Opinion—reviews public opinion solicited before, during and after the study. (See also W79-03164) (Zayac-NC) W79-03170

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VII. APPENDICES M THROUGH S.

Army Engineer District, St. Louis, MO.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A041 698, Price codes: A13 in paper copy, A01 in microfiche. January 1964, 289 p.

Descriptors: *Water resources development, *Multiple-purpose projects, *Recreation, *Fish management.

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WATER RESOURCES PLANNING—Field 6

Evaluation Process—Group 6B

31 multiple-purpose reservoirs; cost estimates for 9 local protection projects; and cost estimates for 26 angler-use sites. Unit costs are based on July 1963 price levels and upon experience of comparable work types in the same area. Allowances are included for contingencies and maintenance during construction. (See also W79-03164) (Zayac-NC) W79-03171

COMMENTS ON ADVANCE COPY OF SUMMARY REPORT ON MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY.

Army Engineer District, St. Louis, MO.

Available from the National Technical Information Service, Springfield, VA 22161 as AD-A036 828. Price codes: A05 in paper copy, A01 in microfiche. 23 April, 1965. 79 p.

Descriptors: *Water resources development, *Planning, *River basin development, *Meramec River(MO), *Reviews, Missouri, Coordination, Water supply, Water quality, Multiple purpose projects, Reservoirs, Participation, River basins.

The Meramec River Comprehensive Basin Study was undertaken to devise a program for development of the Basin's water and related land resources to meet both short- and long-term needs. This volume is a compendium of comments on the draft copy of this study. Contributors include the U.S. Army Corps of Engineers, St. Louis District; Dept. of Health, Education and Welfare, Kansas City Regional Office; and the U.S. Army Corps of Engineers, Board of Engineers for Rivers and Harbors, Washington Office. The memoranda question specific data and wording in the draft report and offer supplementary data to the original study. (See also W79-03164) (Zayac-NC) W79-03172

DATA-INTENSIVE SPATIAL SAMPLING AND MULTIPLE HIERARCHICAL CLUSTERING: METHODOLOGICAL APPROACHES TOWARD COST/TIME EFFICIENCY IN NATURAL RESOURCE ASSESSMENT,

Arizona Univ., Tucson. School of Renewable Natural Resources.

For primary bibliographic entry see Field 6A. W79-03188

COMMERCIAL SAILING VESSELS - AN ECONOMIC ASSESSMENT,

H. M. Close.

The Naval Architect, No. 5, p 166-168, 1978. 2 tab, 11 ref.

Descriptors: *Ships, *Sailing ships, *Costs, *Energy, *Oil, *Transportation, *Economic feasibility, Economics, Wind energy, Operating cost, Investment, Fuels, Capital costs, Cargo, Weight, Carrying capacity.

Commercial wind-powered sailing vessels would be an uneconomical alternative to conventional oil-powered bulk carriers. While fuel savings are considerable, 10 of the smaller (15,000 metric ton) and three of the larger (50,000 ton) sailing ships would be required to provide the 12.1 trillion ton-miles/year carrying capacity of the conventional 100,000-ton ship, bringing total costs to far more than for the oil-powered vessel (24.7, 12.6 and 8.0 million pounds, respectively). The price of oil would have to double before the 50,000-ton wind powered ship would become economically viable. Most previous comparative studies erroneously based their conclusions of deadweight tonnage, whereas the true measure of cargo capacity is the product of deadweight and the distance the ship can cover in a given period (ton-miles). Capital costs of the three ships are estimated (in million pounds) at eight (smaller sailing ship), 12 (larger sailing ship), and 15.5 (conventional carrier). Wind-powered ships average 10 knots, compared with 15 for the conventional ship. The oil-powered ship requires 130 tons of residual oil/day at sea for fuel, plus one ton/day diesel oil for its auxiliary generating plant. The wind-powered vessels have auxiliary engines which consume 10-21 tons residual oil/day. Potential alternative energy sources in-

clude nuclear fission, solar energy, wind-powered generators, and coal. (Lynch-Wisconsin) W79-03192

EXTRACTION, PRODUCTION AND INVESTMENTS IN CAPITAL AND LEARNING, THE NATURAL RESOURCES INDUSTRIES,

Tel Aviv Univ. (Israel). Foerder Inst. for Economic Research.

G. Fishelson.

Working Paper 34-77 November 1977. 21 p, 1 tab, 3 ref, 4 append.

Descriptors: *Natural resource, *Information, *Technology, *Capital, *Investment, *Resource extraction, Industrial production, Model studies, Mathematical models, Optimization, Economics, Economic efficiency, Public benefits, Welfare(Economics), Cost-benefit analysis, Coal mines, Electricity.

Examination of optimal extraction and investment plans for an exhaustible natural resource such as coal shows that scarce resources might be saved by technological progress induced by direct societal investment in learning. This concept augments earlier studies by (1) Burt and Cummings (1970, who examined optimal behavior of extraction and investment in capital of an industry that extracts natural resources when technological progress is exogenously determined, and by (2) Rausser (1974), who expanded this model to include learning-by-doing, thus making technological progress an endogenous variable. The present study assigns a social benefit to the extracted resource only after it is used to produce a consumption good, implying that a learning process carried on simultaneous with production is a substitute for both investment in learning about extraction and in learning-by-doing during extraction. Direct investment in learning supplements learning-by-doing which is a joint product of the extraction activities, and since the total stock of knowledge is thus larger the capital and the exhaustible resource are utilized more efficiently in providing the final good. While Rausser's extension implies that Burt and Cummings extraction rate might be below optimal, the present study suggests that extraction rates might be lower than those by Burt and Cummings. Social benefits in this model are greater than those on the Rausser path, since learning-by-doing is still present while more knowledge is produced by direct investment. (Lynch-Wisconsin)

W79-03194

DYNAMIC THEORY OF FISHERIES ECONOMICS-II; DIFFERENTIAL GAME THEORETIC APPROACH,

Illinois Univ. at Urbana-Champaign. Dept. of Economics.

For primary bibliographic entry see Field 6C. W79-03196

NOMOGRAPHS FOR TEN-MINUTE UNIT HYDROGRAPHS FOR SMALL URBAN WATER-SHEDS,

American Society of Civil Engineers, NY. Urban Water Resources Research Council.

W. H. Espey, Jr., D. G. Altman, and C. B. Graves, Jr.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-282 158. Price codes: A03 in paper copy, A01 in microfiche. ASCE Urban Water Resources Research Program Technical Memorandum No. 32. Dec 1977. 22 p, 8 fig, 3 tab, 33 ref. NSF-APR76-17064 and NSF-ENV77-15668.

Descriptors: *Unit hydrographs, *Urban runoff, *Comprehensive planning, *Project planning, *Urban drainage, *Flood protection, Feasibility studies, Hydrologic data, *Metropolitan studies, *Conjunctive planning, Denver, Colorado, Austin, Texas, Master Planning, Combined sewer overflows, Storm sewer discharges.

While characterizations of 30-minute generalized synthetic unit hydrographs have been available for some time, the 10-minute duration relations pre-

sented extend the usefulness of this basic tool for analysis of the smaller urban catchments. The synthesized equations and associated nomographs are derived from data for 41 urban watersheds in the U.S. of which 18 are in Texas. Reliability can be enhanced by validation with local field data. A validation example is included for Denver, Colorado. Being Addendum 3 of the report 'Urban Runoff Control Planning,' June, 1977 (NTIS: PB-271 548), new references for the latter are included. This technical memorandum is one of several that will contain additional individual Addenda over the period 1977-1979. The principal intended audience is agencies and their agents involved in the preparation of areawide plans for water pollution abatement management under Section 208 of PL 92-500, for whom synthesized unit hydrographs are a potential supplementary tool. (ASCE) W79-03272

URBAN RUNOFF CONTROL PLANNING,

American Society of Civil Engineers, NY. Urban Water Resources Research Council.

M. B. McPherson.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 522. Price codes: A09 in paper copy, A01 in microfiche. ASCE Urban Water Resources Research Program Report NSF/RRA-770184, June 1977. 118 p, 263 ref, 2 append. NSF/RANN-APR76-17064.

Descriptors: *Urban runoff, *Comprehensive planning, *Water quality control, *Flood protection, *Feasibility studies, *Urban drainage, *Project planning, Hydrologic data, Computer models, Land use, Local governments, Design storm, Cost analysis, Detention reservoirs, Water balance, Control systems, Sediment control, Water reuse, Forecasting, Monitoring, *Metropolitan studies, *Integrated management, *Gaging network design, *Conjunctive planning, *Master planning, Combined sewer overflows, Storm sewer discharges, Simulation, Urban runoff gaging, Urban rainfall-runoff-water quality relationships, Receiving waters, Stormwater treatment.

Section 208 of PL 92-500 encourages areawide planning for water pollution abatement management, including urban runoff considerations where applicable. Prepare to assist agencies and their agents that are participants in the preparation of areawide plans, from the standpoint of major urban runoff technical issues in long-range planning, emphasized is the importance of conjunctive consideration of urban runoff quantity and quality and the need to develop a factual basis that will support expected reliability of performance of proposed actions and programs. While not intended as a handbook, some important technical issues are analyzed that are often slight or poorly handled, such as the utilization of simulation. Recognizing that the ultimate test of any plan lies in its implementation, topics are viewed from the perspective and experience of the local government level where implementation takes place. Examples of leading local government projects are included and 310 selected references are cited. (ASCE) W79-03273

ECONOMICS OF MINED LAND RECLAMATION AND LAND-USE PLANNING IN WESTERN STATES,

Argonne National Lab., IL.

J. R. LaFevres.

In: The Reclamation of Disturbed Arid Lands, ed. by R. A. Wright. University of New Mexico Press, Albuquerque. 1978. p 69-71.

Descriptors: *Mine wastes, *Land use, *Reclamation, *Vegetation regrowth, Administration, Comprehensive planning, Adoption of practices, Legal aspects, Contours, Institutional constraints, Economic feasibility.

The cost effectiveness of mined area reclamation programs involves an integrated analysis of extraction, reclamation, and land-use planning. Reclamation efforts should not only restore but improve land values, where possible, and with the participation of the public sector planners who possess

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Group 6B—Evaluation Process

information on future needs and development criteria. Such participation, however, has not been a practice in the past, due largely to public planners' beliefs that reclamation is unprofitable and the possibility of mandatory participation. Additionally, state laws and Federal reclamation bills have precluded effective planning through short-sighted provisions. Failing to understand that effective integration of reclamation and land use planning is dependent upon the physical, legal, social, and economic characteristics of each area, Federal and state authorities have created provisions for reclaiming mined areas to pre-mining contours and natural vegetation. A number of mine sites in the semiarid southwest, including those in Nevada, southern and northern Ariz., and North Dakota are described in an attempt to illustrate present problems and potential solutions. (Ticke-Arizona) W79-03433

THE IMPENDING WATER FAMINE,
United Nations Educational, Scientific and Cultural Organization, Moscow (USSR). International Hydrological Programme.
V. I. Korzun, and A. A. Sokolov.

UNESCO Courier, February 1978, p 5-9, 5 fig.

Descriptors: *Surface water availability, *Hydrologic cycle, *Water shortage, Water balance, Social impact, Economic impact, Freshwater, Population, Industrial water, Water quality, Future planning(Projected), Water Resources Planning, Forecasting, Saline water, Desalination.

Although the present volume of water on Earth is 1.386 billion cubic kilometers, the amount, quality, and use of water form a critical social and economic issue that overrides most others of our time. Since most of our water is concentrated as ocean, it is usable for most purposes only after expensive desalination processes. The most usable water, .007 percent of the world's total water reserves, is unevenly distributed by way of rivers and lakes. Most of the water which reaches the land is reabsorbed into the atmosphere from the seas and oceans, and precipitated into lakes and rivers. Although the ocean acts as an enormous natural desalting plant, most of this precipitation of fresh water is either returned to the ocean by rivers or added to Arctic and Antarctic glaciers. The real problem, then, is not that the earth is short of water but that its replenishment of freshwater is severely limited. Population growth, development of industry and agriculture, increasing consumption, and the deterioration of quality are documented here as the major factors aggravating this already critical problem. A comprehensive argument is set forth in this analysis to demonstrate that by the year 2015, world water resources will be close to exhaustion in the populated regions of the globe. Only by scientific and worldwide planning can measures be developed and implemented at the national, regional, and global levels to prevent further pollution and diminution of water supplies. (Ticke-Arizona)

W79-03435

6C. Cost Allocation, Cost Sharing, Pricing/Repayment

FACTORS UTILIZED IN THERMAL POWER PLANT SITING: A REVIEW THROUGH THE MID-19702,
Clemson Univ., SC. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5G.
W79-03035

DEVELOPING A STATEWIDE WATER INFORMATION SYSTEM FOR MINNESOTA,
Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D.
W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESOTA,

Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.
For primary bibliographic entry see Field 6D.
W79-03122

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME V. APPENDIX E: PROJECT DESIGNS AND COST ESTIMATES; APPENDIX F: HYDROPOWER.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03168

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME VIII. APPENDIX T: DETAILED COST ESTIMATES.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03171

COST OF SOCIAL AND ENVIRONMENTAL REGULATIONS IN CONSTRUCTION,

Ohio Northern Univ., Ada.
For primary bibliographic entry see Field 5G.
W79-03191

DYNAMIC THEORY OF FISHERIES ECONOMICS-II: DIFFERENTIAL GAME THEORETIC APPROACH,

Illinois Univ. at Urbana-Champaign. Dept. of Economics.

T. Takayama.
College of Commerce and Business Administration, Faculty Working Paper 441, October 1977. 27 p, 1 fig, 11 ref, 1 append.

Descriptors: *Fisheries, *Economics, *Game theory, *Theoretical analysis, *Commercial fishing, Open-loop catch strategy, Closed-loop catch strategy, Cournot-Nash equilibrium, Discount rates, Quadratic functions, Optimization, Welfare(Economics).

Differential game theory is applied to a two-country, one species simulation as a natural extension of the dynamic optimization approach to fisheries economics. Two strategies for solving the Cournot-Nash equilibrium are discussed: (1) the closed-loop catch strategy, and (2) the open-loop catch strategy. Quadratic-benefit is used as the objective function of each country seeking maximization subject to linear population-catch dynamics. Major conclusions: (1) stable optimal catches show that each country must regulate the total catch of its fleet; (2) mesh size should be regulated; (3) the open-loop optimal catch strategy exists only when two countries' future discount rates are the same; and (4) the higher the future discount rates, the more fish will be caught now and in the near future, and the slower the convergence of this fish population to the desired level. In the closed-loop case, and increase of country no. one's future discount rate increases the initial optimal catch of country no. one, while country no. two accepts this fact and curtails its optimal catch accordingly. Of course, if the sum of the two countries' discount rates exceeds the rate of increase of the fish population, there will be no economically meaningful solution for the closed-loop strategy game. The open-loop strategy may be too restrictive since the condition for the existence of optimal catches depends on the equality of the two discount rates. (Lynch-Wisconsin)

W79-03196

TRADE-OFFS BETWEEN EROSION CONTROL AND PRODUCTION COSTS IN U.S. AGRICULTURE,

Iowa State Univ., Ames. Center for Agricultural and Rural Development.
For primary bibliographic entry see Field 4D.
W79-03284

6D. Water Demand

POWER DEVELOPMENT AND WATER ALLOCATION IN OHIO RIVER BASIN,
Illinois Univ. at Urbana-Champaign. Inst. for Environmental Studies.
For primary bibliographic entry see Field 5G.
W79-03057

PROCEEDINGS OF A WORKSHOP ON MODELLING OF WATER DEMANDS.

International Inst. for Applied Systems Analysis, Laxenburg (Austria).
Held January 17-21, 1977. Report CP-78-6, June 1978, J. Kindler, Ed. 156 p, 27 fig, 7 tab, 67 ref, 1 append.

Descriptors: *Water demand, *Mathematical models, *Forecasting, Europe, *Water supply, Water utilization, Water resources, Planning, Management, Agriculture, Regional analysis, Economics, Water pollution control, Costs, Linear programming, Equations, Systems analysis.

Water can no longer be considered a free commodity. As nations undertake more and larger projects to meet increasing water demands, the physical limitations of natural water supplies are becoming apparent. Required is an increase in the degree of detail and sophistication of modeling and forecasting water demands, which entails economic, social and environmental evaluation of alternatives aided by the application of mathematical modeling techniques to generate inputs for planning, design, and operational decisions. Presented herein are the proceedings of a Workshop held by the Resources and Environment Area of IIASA in January of 1977, comprising invited papers and reviews that together provide a good overview of what is understood as 'water demand analysis' in most of the IIASA NMO countries. The Workshop was attended by 29 people from 14 countries. Topics considered include: process modeling via linear programming; regional water supply functions; economic demand for water and economic costs of pollution control; and ecological perspective on water demand modeling; and demand modeling in such countries as Germany, Czechoslovakia, the Netherlands, England and Wales; and others. (See also W79-03084 thru W79-03088) (Bell-Cornell)

W79-03083

DEMAND, SUPPLY, AND ECONOMIC EFFICIENCY,

Maryland Univ., College Park.

A. C. Fisher.

In: Proceedings of a Workshop on Modelling of Water Demands, 17-21 January 1977, Laxenburg, Austria. J. Kindler, Ed., International Institute for Applied Systems Analysis, CP-78-6, Laxenburg, Austria, June 1978, p 11-17, 1 fig, 2 ref.

Descriptors: *Water resources, *Demand, *Supply, *Economic efficiency, Management, Equations, Marginal costs, Prices, Welfare, Cost curve, Systems analysis.

This brief paper presents an exposition of the concepts of demand, supply, and economic efficiency as a framework for water demand modeling. The information is addressed to engineers and others concerned with modeling and managing water resource systems. Demand is a relationship between price and quantity purchased, and supply is a relationship between quantity produced and incremental cost. In summary, information about the demand for water is important because without it, efficiency in the development and use of a region's water resources is not possible—even with the best technical and engineering information in the world. (See also W79-03083) (Bell-cornell)

W79-03084

ECONOMIC DEMAND FOR WATER AND ECONOMIC COSTS OF POLLUTION CONTROL,

Houston Univ., TX.

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WATER RESOURCES PLANNING—Field 6

Water Law and Institutions—Group 6E

For primary bibliographic entry see Field 5G.
W79-03085

PROCESS MODELLING USING LINEAR PROGRAMMING, Houston Univ., TX.

J. A. Calloway.
In: Proceedings of a Workshop on Modelling of Water Demands, 17-21 January 1977, Laxenburg, Austria. J. Kindler, Ed., International Institute for Applied Systems Analysis, CP-78-6, Laxenburg, Austria, June 1978, 37-45. 4 fig, 2 tab.

Descriptors: *Resource allocation, Linear programming, *Mathematical models, *Ammonia, *Process modeling, Scarce resources, Demand schedules, Production efficiency, Economic efficiency, Marginal values, Alternative planning, Optimization, Equations, Systems analysis.

Developed is a mathematical model for an industrial, agricultural, or other process which has specific structural and economic properties. The model determines the best or optimal subset of production processes from the complete set of alternatives provided within the model, which is capable of producing derived demand schedules for scarce resources. Linear programming possesses the necessary characteristics to solve the problem of optimally allocating limited resources among competing activities. The model solution: (1) identifies the optimal subset of process alternatives (i.e., the production configuration); (2) the optimum levels of operation for each process selected; (3) the total optimal cost of achieving a desired level of production; and (4) the marginal values of limited resources. Linear programming models are formulated in matrix form where the columns of the matrix describe the processes being modeled. The linear equations are solved simultaneously for values of the activity levels, but since there are usually more variables than equations, many solutions exist. To illustrate model development, an example ammonia supply problem is considered. (See also W79-03083) (Bell-Cornell)
W79-03086

SYSTEMS ANALYSIS APPLIED TO AGRICULTURAL WATER DEMAND, International Inst. for Applied Systems Analysis, Laxenburg (Austria).

D. R. Maidment.
In: Proceedings of a Workshop on Modelling of Water Demands, 17-21 January 1977, Laxenburg, Austria. J. Kindler, Ed., IIASA, Laxenburg, Austria, June 1978, Publication CP-78-6, p 47-56. 4 fig, 11 ref.

Descriptors: *Agricultural, *Water demand, *Systems analysis, Economics, Decision making, Effects, Irrigation, Water supply, Industrial water, Linear programming, Mathematical models, Farm level, Regional level, National level, Systems analysis.

A framework for a systematic approach to the analysis of agricultural water demand is presented in which the factors involved are considered on three levels: the farm, regional, and national levels. The agricultural production system at each level is regarded as having three components: the inputs, the production process, and the outputs. The mathematical modelling of agricultural water demand is discussed from the viewpoint of the substitution possibilities in the production system at each level. It is concluded that on a global basis at the present time, agricultural water demand, primarily for irrigation, is the dominant component of total water withdrawals and consumptive use. It seems most appropriate to consider the balance between the supply and demand for agricultural water at the regional level, the demands being modelled at the farm level using linear programming and then aggregated to find the regional level using demand schedules. Due account must be taken of the differences between agricultural and industrial production processes, particularly with regard to the spatial aspects of agricultural production. (See also W79-03083) (Bell-Cornell)
W79-03087

REGIONAL WATER SUPPLY FUNCTIONS,
International Inst. for Applied Systems Analysis, Laxenburg, Austria.
For primary bibliographic entry see Field 6A.
W79-03088

DEVELOPING A STATEWIDE WATER INFORMATION SYSTEM FOR MINNESOTA, Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.

J. J. Waelti.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 792. Price codes: A03 in paper copy, A01 in microfiche. Completion Report, October 1977. 28 p, 2 fig, 14 tab, 4 ref. OWRT A-031-MINN(4), 14-34-0001-7050.

Descriptors: Planning, *Water rates, *Pricing, *Minnesota, *Surveys, Information exchange, *Sewer water rates, *Information systems.

Results are summarized for a survey on municipal water and sewer rates in Minnesota for 1975. Those utility systems with water meters that have flat charge rate structures for water or sewer should change them to a rate structure which levies charges proportional to water use, preferably a marginal cost pricing system. Those systems using flat charges which have no individual meters should strongly consider installing them since meter installation has been shown to reduce consumption. Declining block rates should not vary the price as much as many rate structures presently do, unless costs can be shown to decline in the same ratio. Minimum demand charges and minimum charges should be dropped in favor of a service charge. (See also W79-03122)
W79-03121

AN ANALYSIS OF RESIDENTIAL WATER DEMAND AND WATER RATES IN MINNESOTA

Minnesota Univ., Minneapolis. Dept. of Agricultural and Applied Economics.

R. L. Gardner.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 687. Price codes: A04 in paper copy, A01 in microfiche. Water Resources Research Center, University of Minnesota, Bulletin No. 96, Sept. 1977. 63 p, 13 fig, 9 tab, 45 ref, append. OWRT A-031-MINN(5), 14-34-0001-7050.

Descriptors: *Water rates, Pricing, *Minnesota, *Water demand, *Municipal water, *Elasticity of demand, Water policy, Use rates, Sewers, Prices, Water utilization, Water conservation, Water consumption, *Residential water demand.

Price elasticity of demand for residential water in Minnesota is examined, along with policy implications. Common rate forms for pricing municipal water are described and analyzed. Recommendations for improving rate structures in Minnesota are made in relation to theoretical and empirical considerations. (See also W79-03121) (Waelti-Minnesota)
W79-03122

LEGAL RIGHTS IN POTOMAC WATERS, PROCEEDINGS OF A CONFERENCE AT HARPER'S FERRY, WEST VIRGINIA.

Interstate Commission on the Potomac River Basin, Bethesda, MD.
For primary bibliographic entry see Field 6E.
W79-03197

INTERNATIONAL GROUNDWATER MANAGEMENT: THE CASE OF THE U.S. - MEXICAN FRONTIERS,

New Mexico Univ., Albuquerque. Coll. of Law.
For primary bibliographic entry see Field 6E.
W79-03216

PRINCIPAL USES OF FRESHWATER IN FLORIDA, 1975,

Geological Survey, Tallahassee, FL. Water Resources Div.
For primary bibliographic entry see Field 7C.
W79-03338

SUMMARY APPRAISALS OF THE NATION'S GROUND-WATER RESOURCE-MID-ATLANTIC REGION,

Geological Survey, Reston, VA. Water Resources Div.
For primary bibliographic entry see Field 4B.
W79-03344

6E. Water Law and Institutions

ENVIRONMENTAL IMPACT STATEMENT PROJECT,

Cornell Univ., Ithaca, NY. Coll. of Engineering.
For primary bibliographic entry see Field 6G.
W79-03041

FLOODPLAIN MANAGEMENT AND WETLAND PROTECTION PROCEDURES INTERIM GUIDELINES.

Department of the Interior, Washington, DC.
For primary bibliographic entry see Field 6G.
W79-03101

WATER RESOURCES POLICIES AND AUTHORITIES: IMPLEMENTATION OF EXECUTIVE ORDER 11988 ON FLOODPLAIN MANAGEMENT.

Corps of Engineers, Washington, DC.
Federal Register, Vol. 43, No. 101, p. 22306-22308, Wednesday, May 24, 1978.

Descriptors: *Flood plains, *Wetlands, *Federal government, *Legal aspects, Protection, Effects, Floods, Planning, Regulation, Water policy.

This proposed regulation prescribes policies to be used by the Corps of Engineers in implementing Executive Order 11988, Floodplain Management as it pertains to the planning, design and construction of civil works projects, and to the activities under the operation and maintenance and the regulatory programs of the Corps. (Stihler-Mass)
W79-03117

STATE LAWS AND INSTREAM FLOWS,

Western Natural Resources Foundation, Salt Lake City, UT.

R. L. Dewsnap, and D. W. Jensen.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 974. Price codes: A04 in paper copy, A01 in microfiche. Fish and Wildlife Service, Publication No. FWS/OBS-77/27, March 1977. 76 p. WELUT No. 023-76, 14-16-0008-2120.

Descriptors: *Instream flow, Minimum flow, *Legal aspects, *Water law, Fish, Wildlife, *Western United States, Washington, Oregon, California, Nevada, Idaho, Montana, Wyoming, Utah, Arizona, New Mexico, Colorado, North Dakota, South Dakota.

Relevant water laws concerning instream flow reservations for fish and wildlife are examined for the States of Washington, Oregon, California, Idaho, Nevada, Montana, Wyoming, Colorado, Arizona, New Mexico, North Dakota, Utah, and South Dakota. The report presents an overview of Western United States' water law, identifies strategies available for reserving flows under existing laws, and presents in a matrix form the legal basis for each strategy on a state-by-state basis.
W79-03120

A 'NEW WEST' RECLAMATION TRAGEDY, THE TWIN FALLS-OAKLEY PROJECT IN IDAHO, 1908-1931,

Boise State Univ., ID.
For primary bibliographic entry see Field 3F.
W79-03132

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

ECONOMIC AND TECHNICAL CONSIDERATIONS OF REGIONAL WATER SUPPLY.
Pennsylvania State Univ., University Park. Inst. for Research on Land and Water Resources.
For primary bibliographic entry see Field 6B.
W79-03140

SUSQUEHANNA RIVER BASIN STUDY: SUMMARY.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03142

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT A—PLAN FORMULATION.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03143

SUSQUEHANNA RIVER BASIN STUDY: SUPPLEMENT B—PROGRAM SUMMARY.
Susquehanna River Basin Study Coordinating Committee.
For primary bibliographic entry see Field 6B.
W79-03144

THE IMPACT OF ENVIRONMENTAL LEGISLATION ON ECONOMIC DEVELOPMENT IN APPALACHIAN NEW YORK.
New York State Dept. of Environmental Conservation, Albany. Office of Program Development and Planning.
For primary bibliographic entry see Field 6G.
W79-03145

WATER AND SEWER FUNDING PROGRAMS AT FMHA, EDA, AND HUD: A SURVEY OF ENVIRONMENTAL IMPLICATIONS.
National Wildlife Federation, Washington, DC. Resources Defense Div.
For primary bibliographic entry see Field 5G.
W79-03147

NEW ENGLAND REGION SUMMARY REPORT: SEVERE RESOURCE PROBLEMS AND RECOMMENDATIONS FOR THEIR RESOLUTION—1975 ASSESSMENT OF WATER AND RELATED LAND RESOURCES.
New England River Basins Commission, Boston, MA.
For primary bibliographic entry see Field 5G.
W79-03151

FLOODPLAIN MANAGEMENT AND WETLANDS PROTECTION.
Small Business Administration, Washington, DC. Federal Register, Vol. 43, No. 101, p 22298-22305, Wednesday, May 24, 1978. 2 append.

Descriptors: *Flood plains, *Wetlands, *Legal aspects, *Federal government, Floods, Rivers, Water policy, Protection, planning, Regulation, Coasts.

This rule adds a new subpart to the Small Business Administration regulation part 116 in order to implement Executive Orders 11988 (Floodplain Management) and 11990 (Protection of Wetlands). Policy and procedures are being established for carrying out the Agency's financial assistance program in accordance with these Executive Orders. (Stihler-Mass)
W79-03152

PROTECTION OF WETLANDS.
Soil Conservation Service, Washington, DC. Federal Register, Vol. 43, No. 127, p 28787-28788, Friday, June 30, 1978.

Descriptors: *Wetlands, *Federal government, *Protection, Marshes, Wildlife, Irrigation, Planning, Water policy, Regulation, Water supply.

These proposed rules codify SCS policy for compliance with Executive Order 11990, Protection of Wetlands in SCS assisted programs. They describe the policy and general constraints placed on SCS personnel when considering the protection of wetlands in carrying out SCS assisted actions in programs administered by SCS. Handbooks and internal guidelines of SCS are being revised and amended to address the specific procedural details of compliance with E.O. 11990. (Stihler-Mass)
W79-03153

THE PUBLIC DECIDES ABOUT WEATHER MODIFICATION.
Colorado Univ., Boulder. Human Ecology Research Services.
For primary bibliographic entry see Field 3B.
W79-03155

RED RIVER OF THE NORTH BASIN.
Environmental Protection Agency, Denver, CO. Region VIII.
For primary bibliographic entry see Field 5G.
W79-03156

ENVIRONMENTAL AND ECONOMIC PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE BURNS WATERWAY HARBOR, INDIANA.
Comptroller General of the United States, Washington, DC.
For primary bibliographic entry see Field 5G.
W79-03157

CONSIDERATION OF FLOOD PLAINS AND WETLANDS IN DECISIONMAKING.
General Services Administration, Washington, DC. Federal Register, Vol. 43, No. 101, p 22309-22311, Wednesday, May 24, 1978.

Descriptors: *Wetlands, *Flood plains, *Federal government, Floods, Effects, Water policy, Regulation, Institutions, Protection.

This notice is intended to inform the public of the action that will be taken within the General Services Administration to minimize the impact of floods on human safety, health and welfare; to minimize the destruction, loss or degradation of wetlands; and to preserve and enhance the natural beneficial value of flood plains and wetlands. (Stihler-Mass)
W79-03175

FLOODPLAIN AND WETLANDS MANAGEMENT.
National Aeronautics and Space Administration, Washington, DC. Federal Register, Vol. 43, No. 112, p 25317-25318, Friday, June 9, 1978.

Descriptors: *Flood plains, *Wetlands, *Protection, *Federal government, Water policy, Legal aspects, Management, NASA.

NASA proposes to provide rules for its implementation of Executive Order 11988—Floodplain Management and Executive Order 11990—Protection of Wetlands. These rules are temporary and provide broad guidance to NASA field installations for the immediate uniform implementation of the Orders. (Stihler-Mass)
W79-03179

THE COMPARATIVE STUDY OF ENVIRONMENTAL POLITICS: FROM GARBAGE TO GOLD,
Uppsala Univ. (Sweden). Dept. of Political Science.

L. J. Lundqvist.
International Journal of Environmental Studies, Vol. 12, No. 2, 1978, p 89-97. 44 ref.

Descriptors: *Political science, Research priorities, *Review, *Environmental politics, *Interest

groups, *Governments, Political aspects, Political constraints, Environmental effects, Environment, Ecology, Social participation, Policy, Administration, Social values, Social aspects.

A literature review of comparative environmental politics and policy stresses the specific responsibility of political science in the process of political change; political scientists should avoid encroaching on the fields of ecology, engineering, or philosophy. Several propositions need further testing and research are derived from the literature: (1) the more open and conflict-oriented the political system, the more immediate and substantial its response to demand for environmental policy, but the less substantial and successful its implementation of policy; (2) the more closed and consensus-oriented the political system, the slower and less substantial its response to demands for policy, but the more substantial and successful its implementation of policy; (3) the more short-term and particularistic the issue pursued by an environmental pressure group, the more democratic the group's internal structure and the more unorthodox and outsider-oriented its strategies of action; (4) the more long-term and general the issue pursued by an environmental pressure group, the more elitist the group's internal structure, and the more orthodox and insider-oriented its strategies for action; and (5) over time, environmental groups tend to perceive their issues and goals in more eternal and general terms, and the groups tend to become more and more elitist in structure and insider-oriented in their strategies. (Lynch-Wisconsin)
W79-03189

WATER RESOURCES PROJECT TYPE ACTIVITIES: CHANNEL MODIFICATION GUIDELINES.

Fish and Wildlife Service, Washington, DC. and Soil Conservation Service, Washington, DC. Federal Register, Vol. 43, No. 41, p. 8276-8280, Wednesday, March 1, 1978. 1 tab.

Descriptors: *Channelling, *Federal government, *Legal aspects, *Regulation, Streams, Habitats, Wildlife, Wetlands.

An interdisciplinary team of specialists from the Fish and Wildlife Service and Soil Conservation Service worked cooperatively to develop these guidelines for channel modification. Guidelines are based on these professionals' own judgment and the suggestions of many other agencies, organizations and individuals. (Stihler-Mass)
W79-03190

THE EXCLUSIVE ECONOMIC ZONE: A CRITIQUE OF CONTEMPORARY LAW OF THE SEA.

Z. A. Kronfol.
Journal of Maritime Law and Commerce, Vol. 9, No. 4, p 461-479, July 1978.

Descriptors: *International waters, *Law of the Sea, *Exclusive economic zone, *United Nations, *Commercial fishing, *Resource extraction, *Jurisdiction, International law, Coasts, Governments, Natural resources, Oceans, UNCLOS III, Shipping, Maximum sustainable yield, Scientific research, Access, Water pollution control, Legal aspects.

A critical assessment of the 200-mi exclusive economic zone (EEZ), being considered by the Third United Nations Conference on the Law of the Sea (UNCLOS III), concludes that such fragmentation of ocean space among more than 100 nations would significantly obstruct vital transnational users of the marine environment. However since adoption of the EEZ is almost certain, the main hope is to retain insofar as possible the rights of the international community within the zone, focusing on functional rather than territorial sovereignty. Activities or entities adversely affected by EEZ recognition include navigation, commercial fishing, resource extraction, access by land-locked or 'geographically disadvantaged' states, scientific research, conservation, and water pollution control. Under the proposed rules the EEZ would remove

about 36 jurisdiction, reassembly Sea-Bed closed w—Japan, and South prehistoric rich cou—fits, w—(Lynch-3

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WATER RESOURCES PLANNING—Field 6

Water Law and Institutions—Group 6E

about 36% of the ocean surface from international jurisdiction and endorse it under national jurisdiction, rendering meaningless the 1970 General Assembly Declaration of Principles Governing the Sea-Bed. Nearly half the ocean area thereby enclosed would be apportioned to high income countries—Canada, U.S., Australia, New Zealand, Japan, some Eastern European countries, U.S.S.R., and South Africa—while just over half would go to the poorer countries. The EEZ is neither a comprehensive solution nor an adequate one, and as rich countries would receive relatively greater benefits, world economic disparities would widen. (Lynch-Wisconsin)

W79-03193

AN APPROACH TO THE OPTIMAL CONTROL OF POLLUTION IN BOUNDARY WATERS,

Guelph Univ. (Ontario). Dept. of Economics.

For primary bibliographic entry see Field 5G.
W79-03195

LEGAL RIGHTS IN POTOMAC WATERS, PROCEEDINGS OF A CONFERENCE AT HARPER'S FERRY, WEST VIRGINIA.

Interstate Commission on the Potomac River Basin, Bethesda, MD.

Held May 14, 1976. Published September 1976. Report ICPRB General Publication 76-2, 213 p., 2 fig., 7 tab, 6 append. Edited by G. Power and R. K. Woloszyn.

Descriptors: *Potomac river, *Water utilization, *Conferences, *River basins, Consumptive use, Diversion structures, Federal jurisdiction, Maryland, Pennsylvania, Virginia, West Virginia, District of Columbia.

This is a compilation of papers presented at a conference of the Interstate Commission on the Potomac River Basin to air differing perspectives and define Basin issues. The papers address water supply issues facing the Potomac Basin including: Is there need for an agency with overall water resource planning and management powers; how should water be priced in the Washington metropolitan area; should proposed U.S. Army Corps of Engineers dams and reservoirs be constructed; do the states of West Virginia and Pennsylvania have the power to divert Potomac waters into other basins; under present law, must Virginia and the Corps of Engineers obtain permission from the state of Maryland before appropriating Potomac waters; and must specific statutes of the various states be changed in order to achieve an economically efficient allocation of water resources. Several papers are footnoted, providing references to original source material. Appended material includes: a proposed bill authorizing the construction of a water diversion structure on the river; proposed amendments to currently applicable law; a statement by the federal Environmental Protection Agency, a consumptive use study; and a copy of the Potomac River Law Flow Allocations Agreement. (Fortin-Florida)

W79-03197

THE DEVELOPMENT OF REGIONAL IMPACT REVIEW PROCESS AND ITS APPLICATION TO GENERAL DEVELOPMENT CORPORATION'S PORT MALABAR DEVELOPMENT IN PALM BAY AND BREVARD COUNTY, FLORIDA,

Florida Univ., Gainesville. School of Law.

J. Corbett.

Available from Eastern Water Law Center, University of Florida, Gainesville, Florida, 32611, 1978. 35 p., 2 append.

Descriptors: *Environmental effects, Project planning, *Florida, *Land development, Environment, Ecology, Environmental control, Legal aspects, Regulation, Administration, Local government, Legislation.

The Development of Regional Impact (DRI) process is an integral part of the Florida Environmental Land and Water Management Act. A DRI is a

development which would have a substantial effect upon the health, welfare, or safety of citizens of more than one county. This article covers: the threshold question of whether a development is one of regional impact; DRI's which are vested and therefore not subject to the DRI review process; the review process from application to appeal; and the enforcement mechanisms available. The DRI process is illustrated by application to a development project located in Palm Bay and Brevard County. Not only does the DRI process insure an in-depth analysis of long regional impacts of the project, but the process also allows local government to condition approval of the development. These benefits accrue to Palm Bay and Brevard County over and above normal land use controls. Rather than a final solution, the DRI process' effectiveness in addressing regional problems will depend on how well local governments exercise their responsibility. (Rule-Florida)

W79-03198

SIGNIFICANT MANAGEMENT ISSUES IN THE LAW OF THE SEA CONFERENCE: ILLUSIONS AND REALITIES,

F. Mirvahabi.

San Diego Law Review, Vol. 15, No. 3 p 493-524, 1978.

Descriptors: *Fisheries, *Law of the sea, *United nations, *Conferences, International waters, Treaties, Oceans, Conservation, Technology, Exploration, International law, Fish management.

Several significant fishery issues are left unsettled by the Third United Nations Law of the Sea Conference. This article discusses these problems and hypothesizes the consequences of non-agreement of the Conference with respect to fisheries. However, the author believes that the Conference will eventually reach a satisfactory conclusion and resulting treaty. The various maneuvering and negotiating techniques among the different factions of nations participating in the Conference are analyzed. Three major areas are explored. These are the 200-mile exclusive economic zone, conservation regimes and regional fishery problems. Each of these areas is examined through a review of the problem, the Law of the Sea Conference approach, the treaty approach and the non-treaty solution. The various proposals on global conservation of fisheries which have been made by fishery experts fall into two categories. The first establishes global standards while mixing the rights and duties of the individual state with those of regional and global organizations. The second proposal suggests that the Committee on Fisheries manage the problem on a worldwide basis. The author suggests adoption of the latter proposal with several suggested additions. (Quarles-Florida)

W79-03199

SUPREME COURT STRIKES NEW BALANCE IN FEDERAL-STATE TENSION OVER WESTERN WATER RIGHTS,

Environmental Law Reporter, Vol. 8, No. 9, p. 10182-88, September, 1978.

Descriptors: *Federal-state water rights conflict, *Federal reclamation law, *Arid lands, *Judicial decisions, Surface waters, Appropriation, Prior appropriation, Federal government, Environmental control, Forest watersheds, Forest management, Constitutional law.

Two recent decisions of the United States Supreme Court have directly affected the authority of federal agencies to acquire, use, or distribute surface waters in the western states. The cases, California v. United States and United States v. New Mexico, are seen by the author as marking a change in direction, if not an about-face, from the previous state of the law in this area. The cases represent a watershed in the history of the federal-state rivalry over the use of western water. California v. United States involves a restrictive reading by the Court of the 1902 Reclamation Act. United States v. New Mexico deals with the 1960 Multiple-Use-Sustained Yield Act, a federal act involving national forests. The long-standing conflict between the western

states and the federal government over control of water rights is traced in order to provide historical perspective. Both the principal cases and related decisions are analyzed in detail. Through this analysis and by way of comment, the author attempts to set out the environmental implications of these and related decisions. (Hucks-Florida)

W79-03200

RESOURCE DEVELOPMENT AND THE SEALED REGIME OF UNCLOS III: A SUGGESTION FOR COMPROMISE,

National Security Council, Washington, DC. Interagency Task Force on Law of the Sea.

M. A. Conant, and C. G. Conant.

Virginia Journal of International Law, Vol. 18, No. 1, p 61-68, Fall, 1977.

Descriptors: *Law of the sea, *Exploitation, *Negotiation, *United nations, International law, Oceans, Ownership of beds, International waters, Natural resources, Economics, Treaties.

The Third United Nations Conference on the Law of the Sea cannot conclude a comprehensive law of the sea treaty until agreement is reached regarding exploitation of seabed resources in the area beyond national jurisdiction. Changing circumstances have led the 'Group of 77,' a coalition of more than 100 developing countries with common interests within the United Nations system, to change the terms on which resource exploitation may take place within their countries. These nations feel they possess unqualified sovereignty over their natural resources. However, United States negotiating principles may be so narrowly defined that these changing circumstances are not appreciated. The basic conditions the developed and developing nations have set on the solution of the seabed regime problem may suggest a compromise solution. The U.S. seems to insist upon seabed exploitation terms which other developed countries do not regard as essential. Although U.S. companies view the concept of joint ventures in a unitary system with apprehension, European interests appear willing to accept this arrangement, which may help break the present deadlock in seabed negotiations. (Rule-Florida)

W79-03201

TERRITORIAL STATUS OF DEEPWATER PORTS,

G. L. Dunfee.

San Diego Law Review, Vol. 15, No. 3 p 603-22, 1978.

Descriptors: *Offshore platforms, *International law, *Deep water, *Ships, United States, Coasts, Legislation, Local government, Oceans, Jurisdiction, Economics, Oil industry.

The rapid growth of the world's supertanker fleet has created the need for deepwater ports to accommodate them. The legal status of these offshore ports is not recognized by existing sea convention law. The necessity of granting territorial status to deepwater ports is examined in this article. The first unilateral declaration dealing with deepwater ports, the United States' 1974 Deepwater Port Act, is discussed. The author concludes that the ports are deserving of territorial status, or at least should be allowed an encompassing territorial sea. Support of territorial status for superports is historical. They are similar in function to both the traditional roadstead and the port. Due to their important coastal purpose, local governments have an interest in regulating superport activities. At the very least, deepwater ports should be used to delimit coastlines. Alternatively, a three-mile territorial sea should be recognized around the ports. Future international agreements should be aware of the special problems of these ports. Finally, freedom of the high seas must be balanced against the need for deepwater ports. Because of national security, environmental control and navigational safety, superports must have territorial status. (Quarles-Florida)

W79-03202

Field 6—WATER RESOURCES PLANNING

Group 6E—Water Law and Institutions

LEGAL CLAIMS TO NEWLY EMERGED ISLANDS,
J. L. Verner, Jr.
San Diego Law Review, Vol. 15, No. 3, p 525-45,
1978.

Descriptors: *Islands, *International law, *Land forming, *Volcanoes, Pacific Ocean, United States, United Nations, Treaties, Continental shelf, Technology, Exploitation.

As a result of some volcanic activity, it now appears that new island may be rising out of the Pacific Ocean between the Volcano and the Mariana Islands. This article poses the question of which country the new land would belong to. Four theories of international law are examined. Two predicate claim to a new island on an existing claim to the seabed from which it arose. The 1958 Geneva Convention and the doctrine of occupation are in this class. The doctrines of occupation and discovery assume that a new island would be a territory owned by no one. Occupation consists of exercising control over a territory, while discovery involves finding and then formally annexing territory. The article concludes that only the latter two doctrines could be used in this situation. The undeveloped geography of the area and the distance from other land would preclude the other doctrines' use. Whether a legal claim to a new island would be pressed by any nation is a matter of conjecture, due to the desired international harmony necessary for settlement of ongoing Law of the Sea Conference negotiations. (Quarles-Florida)
W79-03203

UNITED STATES INTERESTS IN A CONVENTION ON THE LAW OF THE SEA: THE CASE FOR CONTINUED EFFORTS,
Vanderbilt Univ., Nashville, TN. School of Law.
J. I. Charney.
Vanderbilt Journal of Transnational Law, Vol. 11, No. 1, p 39-75, Winter, 1978. 1 app.

Descriptors: *Conferences, *Negotiations, *Law of the Sea, *United Nations, International waters, Fish management, Navigation, Military aspects, Exploitation, Research and development, Oceans, Adoption of practices.

The ongoing United Nations Conference on the Law of the Sea has covered a broad range of issues involving relations between nations with respect to the Oceans. Issues covered include: (1) fishing; (2) national jurisdictions; (3) navigation; (4) environment; (5) scientific research; (6) seabed exploitation; and (7) transfer of technology. The current product of that negotiation is the Informal Composite Negotiating Text (ICNT) containing 303 treaty articles and seven annexes. United States interests in the Conference include: (1) the impact of these negotiations on multilateral relations; (2) the Conference's precedential effect on other international issues; (3) the future use of the Conference negotiating processes; and (4) the development of a third party dispute settlement system in international relations. The United States' substantive interests in the Conference include: (1) the exploitation of the sea's living resources; (2) protection of the marine environment; (3) the conduct of marine scientific research; (4) military and commercial freedom of ocean navigation and use; and (5) the exploitation of the non-living deep seabed resources. These interests are analyzed in the context of an existing Convention as well as the non-convention alternative. Tables are included. (Goldberg-Florida)
W79-03204

ELEVENTH HOUR AMENDMENT TO FWPCA RESUSCITATES EPA'S HAZARDOUS SUBSTANCE DISCHARGE PROGRAM,
Environmental Law Reporter, Vol. 8, No. 11, p 10229-31, Nov. 1978.

Descriptors: *Federal water pollution control act, *Administrative agencies, *Regulations, *Water quality standards, Water pollution, Chemical wastes, Federal government, Ecology, Navigable waters, Pollutants, Pollution abatement.

This is a summary of recent Congressional action amending Section 311 of the Federal Water Pollution Control Act. Section 311 prohibits the discharge of oil on designated hazardous substances from vessels and both onshore and offshore facilities into the navigable waters of the United States, onto adjoining shorelines, or into waters of the contiguous zone. The passage of the amendment, which occurred on the next to the last day of the 95th Congress is seen as breathing new life into the federal program for the regulation of hazardous substance spills into the nation's waters. The legislative history of Section 311 is traced in detail. Also discussed are the problems which were faced by the federal Environmental Protection Agency (EPA) when trying to promulgate regulations implementing the provisions of Section 311. A major stumbling block for the EPA was a federal district court decision, *Manufacturing Chemists Association v. Costle*, which invalidated EPA regulations governing spills and discharges of hazardous chemicals as being inconsistent with the explicit requirements of Section 311. The impact of this case is discussed. (Hucks-Florida)
W79-03205

MINIMUM STREAMFLOWS: THE LEGISLATIVE ALTERNATIVES,

L. P. Hendrix.
Nebraska Law Review, Vol. 57, No. 3, p 704-29, 1978.

Descriptors: *Streamflow, *Irrigation, *Nebraska, *Competing uses, Irrigation effects, River flow, Ecosystems, Regulation, Agriculture, Environmental effects, Intermittent streams, Water utilization.

The concept of 'minimum streamflow,' as applied to Nebraska rivers and streams, is discussed in this article. The term 'minimum streamflow,' as used by the author, means the preservation of instream values - fish, wildlife, recreation, aesthetics, and the environment. The focus of the article is on the dilemma faced by Nebraska legislators when trying to draft streamflow controls. The history of Nebraska as a state dependent on agriculture as an economic resource is traced. Discussed is the role that irrigation plays in supporting and preserving the agriculture industry as are the environmental dangers which result from an uncontrolled use of irrigation. The dangers include intermittent streamflow, dewatering of streams, disruption of ecosystems and the widespread killing of fish and other waterlife. An attempt is made to explore both sides of the issue. The position of environmental groups, such as the Sierra Club and the Audubon Society, who favor maintaining streams in as natural a condition as possible, is contrasted and compared with farmers' interests, which favor legislation maximizing the amount of freshwater available for irrigation. (Hucks-Florida)
W79-03206

STATE OWNERSHIP OF BEDS OF INLAND WATERS - A SUMMARY AND REEXAMINATION,

Missouri Univ. - Columbia. School of Law.
P. N. Davis.
Nebraska Law Review, Vol. 57, No. 3, p 665-703, 1978, 1 tab.

Descriptors: *Ownership of beds, Streams, *Federal-state water rights conflicts, *Inland waterways, State jurisdiction, Federal jurisdiction, Navigable waters, Grants, Proprietary power, Regulation, Rivers, Lakes.

This article summarizes the basic structure of bed title law, focusing on state ownership of the beds of streams, rivers and lakes. State regulatory and proprietary interests which are furthered by such ownership are explored in depth. These include licensing of bed use, leasing of underlying mineral rights, protection of public use rights, assertion of public trust powers and location of boundaries of abutting privately-owned land. The current law affecting state ownership in states created from federal territories is examined. Through the method of case analysis, the criteria used by feder-

al courts when the extent of state ownership of beds formerly federally-owned is explored. Among these criteria are (1) the 'equal footing' rule; (2) the law of federal and patent interpretation; (3) state rules on incidents to title to abutting uplands; (4) federal and state definitions of navigability; and (5) the law of implied grants of land from the sovereign. The law of bed ownership is traced from its common law roots up through current state and federal statutes. Recent Supreme Court decisions affecting this area are discussed and analyzed. (Hucks-Florida)
W79-03207

THE FATE OF NON-COMPLIANT MUNICIPALITIES WITH REGARD TO THE SECONDARY TREATMENT STANDARDS PURSUANT TO THE 1972 FEDERAL WATER POLLUTANT CONTROL ACT AMENDMENTS - A PROBLEM OF ENFORCEMENT,

T. Bondurant.
University of Richmond Law Review, Vol. 12, No. 3, p 581-91, Spring, 1978.

Descriptors: *Federal water pollution control act, *Municipal wastes, *Adsorption of practices, *Law enforcement, Administrative agencies, Legislation, Waste water(Pollution), Permits, Waste water treatment, Remedies, Water quality standards, Cities.

The evolution of the Federal Water Pollution Control Acts (FWPCA) of 1948, 1956, 1965 and 1972 shows the pre-emption of the federal government in water pollution legislation. Individual states failed to enforce water pollution legislation, probably due to fear of driving industry from the state. Thus the federal Environmental Protection Agency (EPA) became the implementor of the 1972 Act. As of July, 1977, about one-half of all municipalities failed to comply with secondary treatment and water quality standards established by the FWPCA. Attributable to the non-compliance are arguments of a general administrative failure and unrealistic and arbitrary deadlines due to insufficient funding of the construction grant program and technical impracticalities. Non-complying municipalities are subject to civil, criminal, and injunctive sanctions but these are impractical and may be unfair to financially strapped municipalities. Thus, the EPA must develop an ad hoc enforcement scheme to preserve the 1972 Act's integrity, while sparing 'faultless' municipalities. The recommended EPA extra-permit mechanism for these 'good-faith' municipalities is the Enforcement Compliance Schedule Letter (ECSL), which extends the deadlines. Two other extra-permit mechanisms that are used to achieve identical results are the court order schedule and the consent order. (Horwitz-Florida)
W79-03208

PUEBLO INDIANS' WATER RIGHTS, NEW MEXICO V. AAMODT, 537 F.2d 1102 (10TH CIR 1976),
W. J. Busch.
Denver Law Journal, Vol. 54, No. 1-2, p 302-12, 1977.

Descriptors: *New Mexico, *Water utilization, *Judicial decisions, *Pueblo water rights, Distribution systems, Appropriation, Reservation doctrine, Competing uses, Priorities, Indian reservations, Treaties, Water resources.

The New Mexico case of *New Mexico v. Aamodt* was brought to determine the state's water rights. The parties were the United States, New Mexico, private landowners and the Pueblo Indians. The district court held that the Indians' water rights are subject to the New Mexico appropriation system. The circuit court reversed, holding that the Indians' rights are superior to all claims except non-Indians claiming adverse possession prior to 1858, and possibly others not relevant here. But the majority declined to define fully the nature of the Indians' rights, and remanded the case for an analysis of the origin of their water rights. Two issues that need to be resolved are the nature of the Indians' aboriginal rights and the quantification

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and priorities system to be used in water distribution. The author argues that an ultimate disposition of the Pueblos' aboriginal rights in the manner of the disposition of Native Alaskan rights should be avoided. The justice of trading money for resources that cannot be replaced by purchase is questionable. This is especially true in the Pueblo's Southeastern area, where the water supply is inadequate and the land is worthless without water rights. (Horwitz-Florida)
W79-03209

A FEE SIMPLE IN WATER OR A TREND TOWARD FAVORING CITIES. CITY OF GRAND JUNCTION V. KANNAH CREEK WATER USERS ASSOCIATION, 557 P.2D 1173 (COLO. 1976).
E. B. Pickell.
Denver Law Journal, Vol. 55, No. 1, p 153-65, 1978.

Descriptors: *Colorado, *Water rights, *Judicial decisions, *Condemnation, Appropriation, Water supply, Cities, Eminent domain, Water storage, Reservoirs, Reservoir storage, Compensation.

The Colorado case of City of Grand Junction v. Kannah Creek Water Users Association had its origin in 1911, when Grand Junction, in an eminent domain proceeding, acquired direct-flow water rights from agricultural appropriators. The judgement awarded the city rights to a continuous flow, but made no express mention of storage rights. In 1973, the city instituted an action to include the right to store water in a reservoir acquired in 1954. Downstream appropriators protested, alleging the city's action would diminish the water quality. The water judge denied storage rights, holding that the city could not divert to the reservoir water not immediately required. The Colorado Supreme Court reversed, distinguishing between water rights acquired by condemnation and by appropriation. It held that the storage right was implied, and was not lost by more than 50 years of non-use, though it would be under appropriation. The author argues that the court disregarded existing Colorado water law in allowing the city to acquire a fee simple in water taken by condemnation, and that further compensation was due the farmers. But the decision may be indicative of an emerging policy to ensure that cities have adequate water supplies in times of shortage. (Horwitz-Florida)
W79-03210

STORING WATER UNDERGROUND: WHAT'S THE AQUIFER,
Nebraska Univ., Lincoln. School of Law.
N. W. Thorson.
Nebraska Law Review, Vol. 57, No. 3, p 581-632, 1978.

Descriptors: *Underground storage, *groundwater resources, *Aquifer systems, *Arid land, Storage, Arid climates, surface water availability, Temporal distribution, Groundwater recharge, Resource allocation, Planning, Public rights.

The elements of a meaningful system of underground water storage rights are examined herein. Ways in which apparent conflicts between the requirements of such a system and presently vested subsurface property rights might be resolved are suggested. Analysis is conducted on three levels. First, the various theories of existing subsurface property rights are examined. These include: (1) the right to store; (2) the right to protect; and (3) the right to recapture. Next, potential conflicts between such existing rights and those elements necessary to a meaningful system of underground water storage rights are identified. Areas of potential conflict include: the allocation of storage rights when storage space is scarce relative to demand; and the resolution of conflicts between ground-storage rights and other property rights. Finally, the author attempts to resolve and avoid potential conflicts by analogizing to the law of surface waters and the law of wild animals. The geographical focus of this article is on the semi-arid western states, where the supplies of usable water are often

geographically isolated from the areas of greatest demand. (Hucks-Florida)
W79-03211

WATER AS A LOCATABLE MINERAL: THE HERESY OF THE CHARLESTONE CASE,
E. M. Hill.

North Dakota Law Review, Vol. 54, No. 3, p. 365-74, 1978.

Descriptors: *Water law, *Groundwater, *Water rights, Water resources, Water users, Groundwater mining, Prior appropriation, Mining, Aquifers, Nevada.

In Charlestone Stone Products, Inc. v. Andrus, a federal district court ruled that water may be classified as a 'mineral,' that Congress has manifested no intention of excluding water from the general category of minerals locatable under the 1872 federal Mineral Location Act, and that therefore water is locatable. Affirmed on appeal, the Supreme Court will review the decision, the sole review issue being whether or not water is a locatable mineral under the 1872 Act. Unless and until the Charlestone case is overturned, the potential impact on both mining and western groundwater laws is considerable. The decision ignores Congressional policy concerning water rights and sets the stage for the destruction of state regulation of water rights in the arid western states. This is so because if water is a mineral locatable under the 1872 Act, a 'miner' is free to install wells on the public domain, and totally deplete the 'mineral deposit' (ground water aquifer) with impunity against state laws regulating water appropriation and use. The Charlestone decision should be reversed. (Fortin-Florida)
W79-03212

WATER USE PERMITS IN A RIPARIAN STATE: PROBLEMS AND PROPOSALS,
Kentucky Univ., Lexington. School of Law.

R. C. Ausness.
Kentucky Law Journal, Vol. 66, No. 2, p. 191-265, 1977-78.

Descriptors: *Kentucky, *Water rights, *Water allocation(Policy), *Evaluation, Natural flow doctrine, Reasonable use, Prescriptive rights, Prior appropriation, Groundwater, Consumptive use, Water resources, Common law.

Although adequate supplies of water are generally available in Kentucky, state law governing its use and allocation are less than satisfactory. Kentucky water law is a complex mixture of common law and statutory water rights. This article attempts to evaluate these rights while suggesting improvements. Common law rules, as they relate to surface water and groundwater, are examined. Kentucky's system of statutory water use regulation is explored, with some of the statutory scheme's more serious deficiencies noted. Short-range legislative changes are recommended, and constitutional issues are accordingly discussed. Long-range alternatives are briefly considered. The common law rules are said to be uncertain, especially regarding surface water. Under Kentucky's present water regulatory law, significant deficiencies remain. The article sets forth a proposal to serve as a model replacement of the present water allocation law.

The proposed law would provide the water regulatory agency with enough authority to implement a state water resources policy without unnecessary interference to private water users. The proposal also abolishes common law water rights without violating substantive due process of law tenets. (Quarles-Florida)
W79-03213

ERRONEOUSLY MEANDED LAKESHORE—THE STATUS OF THE LAW AS IT AFFECTS TITLE AND DISTRIBUTION,
J. H. Ohlander.

Marquette Law Review, Vol. 61, No. 3, p. 515-33, Spring 1978.

Descriptors: *Wisconsin, *Meanders, *Lakes, *Boundary disputes, Legal aspects, Recreation, Surveys, Judicial decisions, Land development, Boundaries(Property), Riparian land.

Increased affluence, coupled with interest in outdoor recreation, have resulted in an increasing demand for lake and country real estate in Wisconsin's northern woodlands. Purchasers may one day find themselves embroiled in disputes over titles to parcels of land which were either mistakenly or fraudulently omitted from the original government surveys. Unfortunately, the applicable law in this area is cryptic and uncertain. However, recent decisions by the Wisconsin Supreme Court have sought to clear up the state of the law. It is clear that when the United States distributes land according to the official plat which depicts meander lines along the margin of an existing body of water, the actual shoreline defines the extent of the grant. Therefore, the owner of land abutting a lake on the official plat is pressured to hold the water's edge. Wisconsin has a 48-year old statute which provides for the equitable distribution of omitted lands in a manner consistent with federal decisions. Two recent Wisconsin cases, read in conjunction with one another, provide for such distribution without a return to the older cases which are inconsistent with federal law. (Quarles-Florida)
W79-03214

CUSTOM AND LAND-BASED POLLUTION OF THE HIGH SEAS,
J. E. Hickey, Jr.
San Diego Law Review, Vol. 15, No. 3, p. 409-75, 1978.

Descriptors: *International law, *Water pollution control, *Oceans, *Pollution abatement, Treaties, Judicial decisions, United Nations, Law of the Sea, Technology, Economics, Political aspects, International law.

The introduction of land-based waste to the high seas becomes a problem when it results in the pollution of the marine environment. To qualify as pollution that would be covered by general customary international law, the result must be real or potential material damage. Only then does the general principle of international law come into play, that being 'sic utere tuo—one must so use his own as not to do injury to another.' Evidence of the obligation not to pollute the high seas in this manner is found in the protests of states, bilateral and multilateral treaties, judicial decisions, the activities of the United Nations, declarations of regional organizations, a growing body of municipal legislation, and work of the International Law Association. Evidence from these sources is explored. There is a growing tendency to apply a strict standard of liability without regard to fault for the violation of the customary international law obligation not to pollute. However, the international community has made only an initial foray into the control of land-based pollution. Technology, politics and economics will play a vital role in this area. (Quarles-Florida)
W79-03215

INTERNATIONAL GROUNDWATER MANAGEMENT: THE CASE OF THE U.S. - MEXICO FRONTIERS,
New Mexico Univ., Albuquerque. Coll. of Law.
A. E. Utton.
Nebraska Law Review, Vol. 57, No. 3, p. 633-63, 1978.

Descriptors: *Groundwater resources, *Resources allocation, *Mexico, *United States, International bound and water commission, International Law, Groundwater, Subsurface waters, Aquifer management, Groundwater availability, Future planning(Projected), Management.

Those states contiguous to Mexico are the United States' heaviest groundwater users, but have inadequate law and institutions to control this exploitation. Additionally, even though the International Boundary and Water Commission has done a great deal toward resolving groundwater problems, in-

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ternational competence over aquifers divided by the border is not defined. The government of Mexico can regulate groundwater extraction through its Secretariat of Water Resources which can establish prohibited groundwater zones if it is in the public interest. An anticipated increasing investment in groundwater facilities and concurrent demand on the groundwater resources divided by the national border, coupled with the absence of dispute resolution or management institutions increases the potential for Mexican-U.S. dispute over resource control. The economic context and alternative institutional opportunities are examined in this article, while possible management options are investigated. Equitable apportionment, case-by-case negotiation, and comprehensive management are considered, as is international litigation. Whatever options or combinations of options are chosen. It would be better to reach agreement rather than gamble with the uncertainties inherent in litigation before the International Court of Justice. (Rule-Florida) W79-03216

REGIONAL LAW OF THE SEA: A PROPOSAL FOR THE PACIFIC,

Micronesia Congress, (Trust Territory of the Pacific Islands).

F. L. Ramp.
Virginia Journal of International Law, Vol. 18, No. 1, p. 121-32, Fall 1977.

Descriptors: *International law, *Commercial fishing, *Regional analysis, *Pacific Ocean, Water resources management, Resource allocation, Regional economics, United Nations, Management, Fish management, Law of the Sea, Regional development.

Central and western tropical Pacific states and territories consist mostly of very small islands clustered together into political and cultural groups. Foreign fishing vessels, mostly Japanese, harvest most of the fish taken in the area with little concern for conservation and management. Pacific states are now preparing to take advantage of the 200-mile economic zone giving them resource ownership rights over these fishing areas, thus changing the area's history of free access. Regional law of the sea arrangements in the Pacific would promote shared legal claims and provide efficient use of regional waters, as well as aid individual ends. Common interests and needs in the regions include: effective management of highly migratory species of fish, collection of scientific data, avoidance of wasteful and destructive investment policies, equitable treatment for all states and territories in the region, and enforcement. A major benefit to member states would be the ability to negotiate with distant water fishing states. A large portion of the exclusive economic zone waters of the region belong to territories that are less than fully independent states. The informal Composite Negotiating Text of UNCLOS III should protect their rights. (Rule-Florida) W79-03217

THE UNITED NATIONS CONFERENCE OF THE SEA (PANEL DISCUSSION AT THE ANNUAL MEETING OF THE AMERICAN BAR ASSOCIATION SECTION OF INTERNATIONAL LAW),

American Bar Association, Chicago, IL.
International Lawyer, Vol. 12, No. 1, p. 21-62, Winter, 1978.

Descriptors: *Law of the Sea, *International waters, *Conferences, *United Nations, Oceans, Mining, Ownership of beds, International law, Negotiations, Resource allocation, Exploration, Exploitation.

Speakers at the American Bar Association Section of International Law's panel discussion on the United Nations Conference on the Law of the Sea included the head of the Mexican delegation to the Conference, Ambassador Jorge Castaneda. He discussed the exclusive economic zone, under which each coastal state has sovereign rights to exploit and manage the living and nonliving ocean re-

sources up to a distance of 200 miles from their coasts beyond a territorial sea of 12 miles. Bernard Oxman, deputy head of the United States delegation to the conference, discussed the legal problems inherent in the international law of the sea, and in the interpretation of the Informal Composite Negotiating Text. Myron Nordquist, member of the United States delegation and the State Department's Office of the Legal Advisor, remarked upon changes undergone by the Law of the Sea in the past few years. John Laylin, a member of the State Department's Advisory Committee on the Law of the Sea, discussed deep ocean mining, with emphasis on domestic legislation and possible future courses of action. Finally, the area of development of procedures for compulsory settlement of disputes was covered by Louis B. Sohn, Professor of International Law at Harvard Law School. All presentations and discussion are provided in this article. (Rule-Florida) W79-03218

REFLECTIONS ON THE FINAL CLAUSES IN THE NEW LAW OF THE SEA TREATY,

S. Rosenne.
Virginia Journal of International Law, Vol. 18, No. 1, p. 133-46, Fall 1977.

Descriptors: *Treaties, *Law of the Sea, *International law, *United Nations, International waters, Legal aspects, Negotiations, Project planning, Conference, Analysis, Oceans.

The text of a treaty's 'final clauses' cannot be settled until the end of the treaty's negotiations. The Informal Composite Negotiating Text issued at the end of the Sixth Session of the Third United Nations Conference on the Law of the Sea included final clauses, primarily noncontroversial and nonsubstantive provisions regarding ratification, accession, entry into force, the status of annexes, the authentic texts, and the testimonium. These clauses are concerned with matters which arise before the entry into force of the treaty. Possible final clauses embodying substantive agreements on the application of the law of treaties or of general international law to this treaty include the question of the relationship of the proposed new convention with other treaties, especially the 1958 Conventions on the Law of the Sea, and the problem of reservations to the new convention. Eventually these clauses—which are traditionally the most controversial—will be drawn into the general negotiations. There are few precedents for the type of problems regarding the final clauses in the proposed convention on the Law of the Sea, thus constructive innovation and the highest degree of legal acumen will be called for. (Rule-Florida) W79-03219

A NEW COMBINATION TO DAVY JONES' LOCKER: MELEE OVER MARINE MINERALS,

J. K. McCall.
Loyola University of Chicago Law Journal, Vol. 9, No. 4, p. 935-64, Summer, 1978.

Descriptors: *Manganese, *Mining, *Law of the Sea, *Negotiations, International waters, Mineral industry, Oceans, International law, Resources, Exploitation, Conferences, United Nations.

Manganese nodules, mineral conglomerations found on the ocean floors, have recently become the focal point of great interest on the part of industry, financial institutions and governments. The nodules, which have formed over millions of years, contain valuable deposits of nickel, copper, manganese and cobalt. The recent surge of interest in manganese nodules is attributable to increased world need for minerals and the advancement of technology necessary for retrieving the deposits. This increased interest has raised two important questions: (1) who is entitled to mine the nodules; and (2) under what conditions should mining operations be carried out. The complexity of these questions is furthered by the fact that the nodules do not lay within the territorial jurisdiction of any sovereign. Resolution of these questions is necessary for the expansion of this industry. The United

Nations Conference on the Law of the Sea has attempted for four years to negotiate a treaty outlining the permissible scope of nodule mining. Thus far the Conference has been unsuccessful. This article examines the current status of nodule mining and analyzes recent attempts by the United Nations and individual countries to institute mining guidelines. (Hucks-Florida) W79-03220

IMPLIED RESERVATION CLAIMS AFTER CAPPAERT V. UNITED STATES,

C. S. Murray.
Arizona State Law Journal, Vol. 1977, No. 3, p. 647-72, 1977.

Descriptors: *Water allocation(Policy), *Reservation doctrine, *Federal-state water rights conflicts, *Desert land act, Water resources, Public lands, Regulation, Federal jurisdiction, Water rights, Proprietary power, Arid lands, Competing uses.

In the arid western states water has become a scarce and valuable natural resource. In response to this scarcity various doctrines have been developed pertaining to rights of ownership and control over water supplies. One such doctrine is implied reservation. When Congress sets aside land in the public domain for a particular purpose, it impliedly reserves water rights for the benefit of those reserved lands—sufficient water to accomplish the intended purpose. The Supreme Court has recently supported the implied reservation doctrine in *Cappaert v. United States*. The significance of the *Cappaert* case is examined in detail. A framework for the analysis of federal claims under the doctrine is offered. Two basic issues likely to arise under the doctrine are analyzed: first, how the existence or non-existence of a federally reserved water right will be determined in a particular situation; and second, once the existence of such a right has been established, how the reservation will be quantified. Economic, social and political ramifications of the doctrine are discussed. (Hucks-Florida) W79-03221

THE INTERRELATIONSHIP OF GROUND AND SURFACE WATER: AN ENIGMA TO WESTERN WATER LAW,

M. C. Haase.
Southwestern Nevada Law Review, Vol. 10, Special Issue, p. 2069-87, 1978. 3 fig, 1 tab.

Descriptors: *Surface-groundwater relationships, *Groundwater resources, *Water management(Applied), *Water conservation, Groundwater recharge, Hydrologic budget, Recharge, Hydrology, Hydrologic aspects, Groundwater potential, Aquifers, Water requirements.

Ground water as a direct or indirect source of water is not inexhaustible if consumption rates continue their rapid rise. Unplanned exploitation of ground water may affect surface water rights and water tables may be depressed. Allocation of available water among claimants could give rise to legal, administrative, and economic problems. State and federal authorities must therefore stop dealing with water problems on an ad hoc basis and instead develop water use, allocation and conservation plans through the enactment and enforcement of viable and practical laws. However, before this can be done, the legal and judicial worlds must understand the interrelationship of hydrology to the total environment, especially the direct relationship between surface and ground waters. The most efficient method of providing resource management would appear to be zoning, which also has the benefit of avoiding serious conflicts with fifth amendment prohibitions and requirements. Coordination of the numerous factors that must be considered in land/water resource planning could be incorporated in a regional or national zoning agency. (Rule-Florida) W79-03222

CONGRESS, THE COURT, AND WATER POLLUTION,

Chicago Univ. Law School, IL.

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WATER RESOURCES PLANNING—Field 6

Water Law and Institutions—Group 6E

D. P. Currie.

The Supreme Court Review, p. 39-63, Univ. of Chicago Press, Chicago, Ill., 1977.

Descriptors: *Federal water pollution control act, *Administrative decisions, *Judicial decisions, *Analysis, Water pollution, Legislation, Pollutants, Administrative agencies, Permits, Technology, Standards, Regulation.

The Federal Water Pollution Control Act (Act) prohibits the discharge of any pollutant with several specific exceptions provided in the Act. Several critical dates are provided in the Act for the implementation of the proper technology required for effluent limitations of point sources. In a recent United States Supreme Court decision, the Court held that the federal Environmental Protection Agency Administrator may adopt 1977 and 1983 effluent limitations by regulation and that there is no requirement that he provide for variances from the new-source standards. The first part of the holding, which has been the subject of constant litigation, is of virtually no practical significance. Industry insists that effluent limitations should be set in the course of issuing individual permits, not by regulation. Lying behind this position is the practical question whether the appropriate technology required was to be determined on a nationally uniform or a plant-by-plant basis. However, this question does not depend upon whether the Administrator may adopt limitations by regulation. Either way, the question of flexibility and variation remains. The article concludes that the case leaves the question unresolved. (Quarles-Florida)
W79-03223

HARD MINERALS ON THE DEEP OCEAN FLOOR: IMPLICATIONS FOR AMERICAN LAW AND POLICY,

R. F. Pietrowski, Jr.

William and Mary Law Review, Vol. 19, No. 1, p. 43-75, Fall 1977.

Descriptors: *Law of the sea, *Mineral industry, *Legislation, *United Nations, Oceans, United States, Legal aspects, International waters, Treaties, Negotiations, Jurisdiction, International law.

The Third United Nations Conference on the Law of the Sea recently reconvened for its sixth session. This article reviews the American deep-sea mining policy and maintains that, under existing international and domestic law, American companies may legally mine the seabed's resources. Moreover, because the United States depends on foreign sources for minerals also, America should undertake unilateral action to encourage and protect deep-sea mining companies. Congress must assure American industries' access to the minerals of the deep seabed at a reasonable cost. If a treaty resembling the new Informal Composite Negotiating Text becomes binding, prior ocean mining investments will be rendered worthless. Companies cannot be expected to invest further in deep-sea mining and risk great loss without congressional guarantee of protection. Without this guarantee, the ocean's mineral resources will remain beyond the economic reach of American businesses. With such protection, the United States can become self-sufficient in its needs for manganese, nickel, cobalt and copper. These conclusions are reached after an examination of existing international law, proposed changes, and federal legislative efforts. (Quarles-Florida)
W79-03224

AGRICULTURAL WATER QUALITY ACT.

Hearing, Subcomm. on Conservation and Credit, Committee on Agriculture, U.S. House of Representatives, Sept. 16, 1977, Serial No. 95-EE, 44p.

Descriptors: *Agriculture, *Water quality standards, *Water conservation, Future planning(Projected), Environmental effects, Conservation, Negotiations, Farms, Irrigation, Drainage practices, Water quality control.

This hearing of the Subcommittee on Conservation and Credit of the U.S. House of Representatives'

Committee on Agriculture was called to discuss problems in the proposed Agricultural Water Quality Act—House Bill 8150—a bill to provide for the maintenance or enhancement of the quality of water in rural areas. Verbatim statements made before the Subcommittee by the following individuals are included: John Adams, director, Environmental and Consumer Affairs Division, National Milk Producers Federation; Thomas Barlow, Natural Resources Defense Council; Lyle Bauer, vice president, National Association of Conservation Districts; Albert Erickson, Associate Deputy Assistant Administrator for Water Planning and Standards, Environmental Protection Agency; James Jeffords, U.S. Rep. from Vermont; Robert Koch, president, National Limestone Institute, Inc.; Richard Swain, executive director, Obion Forked-Deer Basin Authority, Tennessee; and Edward Thomas, acting administrator, Soil Conservation Service, U.S. Department of Agriculture. Also included is a letter from Thomas Kimball, representing the National Wildlife Federation, containing informal comments on the proposed bill as well as formal Federation resolutions pertaining to its passage. A copy of the proposed bill is provided. (Easterbrook-Florida)
W79-03225

FEDERAL WATER POLLUTION CONTROL ACT AMENDMENTS OF 1977 (PORTLAND, ME.).

Hearings, Subcomm. on Environmental Pollution, Comm. on Environmental and Public Works, U.S. Senate, June 1, 1977, Serial No. 95-H25, Part 1, 263 p.

Descriptors: *Federal water pollution control act, *Continental shelf, *Federal jurisdiction, *Shore protection, Maine, Oil spills, Fisheries, Environmental control, New England, Legislation, Developed waters, Coasts.

The U.S. Senate Subcommittee of Environmental Pollution met to hear testimony on federal water pollution law issues including: the environmental implications of the development of the Outer Continental Shelf; the success of the Maine water pollution control program; progress and problems of the paper industry and its compliance with the Clean Water Act; and alternative treatment technologies for small communities. The issues selected for this hearing were all of particular importance to the people of Maine and other Atlantic Coastal states. The citizens of those states value deeply the unique fishery and recreational resources which they have. One purpose of the hearing was to gather information necessary to assure environmental protection of Maine's water resources. The greatest threat to these resources lies with the risk of oil tanker accidents along the coast. Under new rules, the Subcommittee has expanded jurisdiction over ocean pollution problems and issues. The Federal jurisdiction extends to the 200-mile limit. The verbatim text of all statements given before the Subcommittee is included, as well as numerous maps, graphs and technical data tables. (Hucks-Florida)
W79-03226

WATER FOR FIVE CENTRAL ARIZONA INDIAN TRIBES FOR FARMING OPERATIONS.

Hearings, Select Committee on Indian Affairs, U.S. Senate, May 23 and 24, 1977, 623 p.

Descriptors: *Arizona, *Indian reservations, *Surface water, *Agriculture, Irrigation systems, Surface water availability, Administrative agencies, Aquifers, Costs, Legal aspects, Water rights.

Senate Bill 905 provides for the federal acquisition of existing water rights with the state of Arizona to secure a permanent water supply for five central Arizona Indian tribes as a settlement of their legal rights. The Bill also calls for the construction, extension, or rehabilitation of the water delivery systems within each reservation. The 'Winters' case gave the Arizona tribes legal rights to that quantity of surface water necessary to fulfill the purpose for which the reservations were created.

These rights were further refined in the later case of *Arizona v. California*, setting up the standards of 'practically irrigable acreage'. This case granted the five tribes the legal rights to sufficient surface water to farm all 'practically irrigable' lands. It was suggested that a legislative settlement would avoid costly and lengthy litigation. This document contains all verbatim testimony of witnesses relating to the passage of Senate Bill 905. Witnesses include spokesmen for each of the tribes, various federal and Arizona governmental agencies, state and local water resources agencies and U.S. Senate DeConcini, Goldwater and Kennedy. Numerous maps, graphs and tables are also included. (Goldberg-Florida)
W79-03227

OIL SPILL LIABILITY AND COMPENSATION.

Hearings, Committee on Commerce, Science, and Transportation, U.S. Senate, June 9, 10, & 20, 1977, Serial No. 95-27, 346 p.

Descriptors: *Oil spills, *Transportation, *Compensation, *Associated costs, Shore protection, Oil pollution, Oil industry, Environmental effects, Economic impact, Damages, Legislation, Adoption of practices.

These hearings before the U.S. Senate Committee on Commerce, Science, and Transportation addressed the problems of oil spill liability and compensation. The Senate has already passed Senate Bill 682, The Tanker and Vessel Safety Act, which upgrades construction, operation, and manning standards for all vessels entering U.S. waters and ports. But, as long as oil moves on water, there will be oil spills, attendant damage and injured third parties. Despite several major oil spill incidents, there has yet to be enacted a law which compensates oil spill victims quickly and without great difficulty. Since oil spill damage is one of the economic costs of transporting and using petroleum, these bills are intended to internalize those costs and thus show the true cost of petroleum. Senate Bills 121, 687, and 1187 would establish a uniform and comprehensive legal regime governing liability and compensation for damages and cleanup costs. Senate Bill 182 would amend the 1972 Ports and Waterways Safety Act and establish comprehensive liability and compensation for damages from oil spills. Senate Bill 898 is titled 'Spill Prevention and Cleanup for Energy Transportation Systems Act of 1977'. All testimony given before the committee, and relevant tables, is included. (Goldberg-Florida)
W79-03228

LAW OF THE SEA CONFERENCE STATUS REPORT, SUMMER 1978.

Hearing, Committee on International Relations, U.S. House of Representatives, May 24, 1978, 61 p.

Descriptors: *United Nations, *Law of the Sea, *International law, *Conferences, Continental shelf, International waters, Oceans, Economics, Negotiations, Resources development, Research and development, Ownership of beds.

The U.S. House of Representatives' Committee on International Relations held a hearing to receive a status report on the United Nations' Law of the Sea Conference. The Committee's ultimate goal is to negotiate the substance of a treaty establishing the rule of law for the oceans. The principal speaker was Elliot Richardson, special representative of the President to the Conference. Richardson's report discussed the achievements of a previous Conference session. In the report, seven issues were identified as hardcore and negotiating groups were established to deal with them. These issues included: (1) exploration and exploitation of the seabed; (2) financial arrangements between seabed mining companies and the proposed U.N. Authority that would be created to oversee this developing area of international law and relations; (3) the institutional framework of the Authority; (4) access of landlocked and geographically disadvantaged states to sea resources; (5) sovereign rights of states within their exclusive economic zone; (6) definition

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of outer limits of the continental shelf; and (7) delimitation of maritime boundaries. Attention was also given to the problem of maritime pollution. Richardson's verbatim report to the Committee is included as is the U.S. delegation's unclassified report. (Husk-Florida)
W79-05229

DEEP SEABED MINERALS: RESOURCES, DIPLOMACY, AND STRATEGIC INTEREST.

Prepared by Congressional Research Service, Library of Congress for the Subcomm. on International Organizations, Comm. on International Relations, U.S. House of Representatives, March, 1978, 123 p.

Descriptors: *Mineral industry, *International waters, *Law of the sea, *Mining, Resources, Legislation, United Nations, Nickel, Copper, Cobalt, Manganese, Technical writing.

A study of deep seabed minerals has been prepared by the Congressional Research Service for the use of the U.S. House of Representatives' Committee on International Relations. The study is intended to clarify a number of issues surrounding domestic and international discussion of deep seabed mining and to assist Congress in considering appropriate legislation. The study summarizes the development of the deep seabed mining issue in the United Nations' Third Law of the Sea Conference, the United States Congress, and the business community. The study also provides an overview of the use, supply, and demand of nickel, copper, cobalt and manganese. Short and long-term trends in supply are discussed, as well as projections for deep seabed mining. A discussion of the possibilities of cartelization is also included, along with the United States' stockpile strategy. The report includes an analysis of the defensibility of seabed mining operations within the context of a changing ocean regime. The final section contains projections of possible mineral recovery and economic benefits of seabed mining. Some perspective on the possible costs and benefits to the United States are set forth. The need for immediacy of the commencement of deep seabed mining is emphasized. (Quarles-Florida) W79-03230

OILSPILL CONTINGENCY PLAN.

Hearings, Subcommittee of Committee on Government Operations, U.S. House of Representatives, Feb. 2 and 3, 1977. 383, 2 app.

Descriptors: *Environment, *Oilspills, *Transportation, *Comprehensive planning, Environmental effects, Oil pollution, Oil industry, Pollutants, Shore protection, Shore birds, Contingency costs, Legislation.

This House of Representatives Subcommittee on Environment, Energy and Natural Resources addressed the problem of oilspills as they relate to damage done to the environment. The hearing focused on the nations ability to respond quickly and effectively to an oilspill emergency. Although the 1972 Federal Water Pollution Control Act addresses this problem in a broad sense, the committee recognized the need for a more comprehensive and coordinated oilspill contingency plan aimed at minimizing the environmental damage caused by oilspills. It is United States' dependence on foreign oil which is exacerbating the problem. Due to the ever increasing volume of oil being transported by ocean-going vessels, the probability of massive oilspills increases proportionately. Testifying before the committee were representatives of those federal agencies having major responsibility under the proposed Oilspill Contingency Plan. Agencies represented included: (1) the Environmental Protection Agency; (2) the Center for Law and Social Policy; (3) the National Oceanic and Atmospheric Administration; and (4) the U.S. Coast Guard. All testimony given before the committee, including maps and tables, is included. (Goldberg-Florida)
W70.03231

INDIAN FISHING RIGHTS.

Hearing, Subcommittee on Fisheries and Wildlife Conservation and the Environment, Committee on Merchant Marine and Fisheries, U.S. House of Rep., Jan. 13, 1978, Serial No. 95-27, 325 p. app.

Descriptors: *Indian reservations, *Fishing, *Resource allocation, *Great Lakes, Fisheries, Federal jurisdiction, Lampreys, Michigan, Regulation, Judicial decisions, Resources, Competing uses.

The House of Representatives Subcommittee on Fisheries and Wildlife Conservation and the Environment met to discuss the extent to which the Federal Government may help resolve conflicts between competing users of Great Lakes fishery resources. Parties to the controversy are Indian-American and non-Indian fishermen. Certain court decisions have ordered a share of fishing waters set aside for exclusive Indian use. Further, the Department of Interior has been ordered by the Supreme Court to act in support of Indians in judicial matters, in its capacity as trust agency over Indian affairs. These federal actions have given rise to strong objections by non-Indians who believe they are being discriminated against in the access to the fishery. The Great Lakes have significant commercial, recreational and esthetic values. Traditionally, the states surrounding the Great Lakes have had principal responsibility for managing the fishery resource. However, traditional state regulation has come into doubt as applied to Indian-Americans. The Federal Government takes the position that Indian-American fishermen cannot be regulated in the same manner as other recreational and commercial fishermen. Testimony of witnesses from both sides of the controversy is included. (Hucks-Florida)
W70.03232

ARKANSAS RIVERBED RIGHTS OF CHEROKEE, CHOCTAW, AND CHICKASAW INDIAN NATIONS.

Hearing Select Committee on Indian Affairs, U.S.
Senate, May 25, 1977, 242 p.

Descriptors: *Indian reservation, Federal government, *Riverbeds, *Ownership of beds, *Interstate rivers, Oklahoma, Federal government, Legislation, Property values, Arkansas, Appraisals, Water rights.

This hearing before the U.S. Senate Select Committee on Indian Affairs addressed Senate Bill 660. The proposed bill authorizes the Secretary of the Interior to enter into an agreement with the Cherokee, Choctaw and Chickasaw Indian nations providing for the purchase and/or lease by the United States of each nation's rights and interests in the riverbed of the Arkansas River. Through litigation concluded in the Supreme Court, the three Indian nations have recovered from the state of Oklahoma and other trespassing parties, the fee simple title and possession of the Arkansas River riverbed from the confluence of the Grand-Neosho River in Oklahoma to the western boundary of the State of Arkansas. Appraisals of the riverbed property and property rights have been made and accepted. This bill serves to authorize the Secretary of the Interior to begin formal negotiations. All testimony

PROTECTION AND ENHANCEMENT OF SOIL AND WATER RESOURCES

SOIL AND WATER RESOURCES.
Hearings, Subcomm. on Environment, Soil Conservation and Forestry, Comm. on Agriculture, Nutrition, and Forestry, U.S. Senate, August 2 and 4, 1977, 162 p. app.

Descriptors: *Soil conservation, *Water quality, *Erosion, *Agriculture, Water resources, Legislation, Forestry, Rural areas, Administrative organization.

Cies, Sediments, Land use, Comprehensive planning.

Hearings before the U.S. Senate's Subcommittee on Environment, Soil Conservation, and Forestry were held to discuss two pending bills. The first, Senate Bill 1280, provides for the maintenance or enhancement of the quality of water in rural areas. The second, Senate Bill 1616, establishes a national policy concerning agricultural, range, and forest land. Senate Bill 1616 also establishes an agricultural land review commission to begin a demonstration program for protecting agricultural, range, and forest land from being used for nonagricultural purposes. These two bills address the serious need to conserve soil. Reliable sources indicate that a significant portion of our nation's agricultural resource base is being damaged through erosion and land-use changes. Copies of both of the proposed bills are provided, along with expert testimony received by the subcommittee. The Soil Conservation Service Administrator testified as to the enormous problems of erosion and sedimentation. A spokesman for the National Farm Growers Association expressed the Association's complete support of the bills, as did a spokesman for the National Farmers Union. Nearly all of the witnesses expressed concern over the rapid rate of disappearance of agricultural land. All testimony given before the Subcommittee is included. (Quarles-Florida) W79-03234

DEEP SEABED MINING.

Hearings, Subcommittee on Oceanography, Committee on Merchant Marine and Fisheries, U.S. House of Representatives, March 17, 18, April 19, 26, 27, May 11, 20, 1977, Serial No. 95-4, 570 p.

Descriptors: *Oceanography, *Mining, *International waters, *Law of the Sea, Deep water, Mineral industry, Mineralogy, Oceans, International law, International commissions, Ownership of beds, United Nations.

The formulation of a comprehensive law regulating the activities of all nations upon the high sea has been continuing since the 1950s. While United Nations Law of the Sea Conference sessions have made progress in resolving differences relating to fisheries, marine pollution and continental shelf matters, it was widely felt that an impasse had been reached in resolving disputes involving the deep seabed. These House of Representatives Hearings before the Subcommittee on Merchant Marine and Fisheries addressed House Bills 3350, 4582, 3652, 4922, 5624, 6846 and 6784. House Bills 3350 and 4582 are bills to promote the ordinary development of hard mineral resources in the deep seabed, pending the adoption of an international regime relating thereto. House Bills 3652, 4922, 5624, and 6846 are bills to insure the development of United States ocean mining capabilities and support the continuation of the Law of the Sea Conference negotiations. House Bill 6784 is a bill to encourage an international regime to govern the use of the oceans and their resources. All testimony given before the committee is included. (Goldberg-Floridan)

**FEDERAL WATER POLLUTION CONTROL
ACT AMENDMENTS OF 1977 (FORT COL-
LINS, COLORADO)**

LINS, COLORADO).
Hearing, Subcommittee on Environmental Pollution, Committee on Environment and Public Works, U.S. Senate, June 13, 1977, Serial No. 95-H25, Part 4, §11.

Descriptors: *Federal water pollution control act, *Colorado, *Arid land, *Water resources, Environment, Agriculture, Waste treatment, Dredging, Municipal wastes, Regulation, Water quality, Planning.

This is a report on hearings of the U.S. Senate's Environmental Pollution Subcommittee held to discuss implementation of and possible amendments to the Federal Water Pollution Control Act (FWPCA). This hearing focused on three issues of

WATER RESOURCES PLANNING—Field 6

Water Law and Institutions—Group 6E

particular concern to Colorado and the rest of the arid and semiarid West: (1) the relationship of the clean water program to agriculture; (2) the problems of financing municipal waste treatment plants; and (3) the implementation of the '404' dredge-and-fill program. Witness testimony on the first issue discusses the effectiveness of the law in dealing with point sources; and what progress if any has been made in abating pollution from nonpoint sources not within the FWPRA regulatory program. Testimony on the second issue relates to the collection of charges to cover operating and maintenance costs of municipal waste water treatment plants, and the impact of delays in federal funding on state and local planning activities. Testimony on the third issue relates to the controversy over the FWPRA's section 404 dredge-and-fill program which ostensibly arose out of misunderstandings of the provision and inaccurate publicity. All testimony is included. (Hucks-Florida)
W79-03236

IMPLEMENTATION OF THE FEDERAL WATER POLLUTION CONTROL ACT (REGULATION AND MONITORING OF TOXIC AND HAZARDOUS CHEMICALS).

Hearings, Subcomm. on Investigation and Review, Committee on Public Works and Transportation, U.S. House of Representatives, July 19, 20, 21, 27, 28, 1977. Serial No. 95-32, 42 p. app.

Descriptors: *Federal Water Pollution Control Act, *Sewage treatment, *Ohio River, *Chemical wastes, Toxins, Hazards, Chemicals, Monitoring, Regulation, Pollutants, Industrial wastes.

Under the auspices of the Federal Water Pollution Control Act (FWPCA), the House Subcommittee on investigations and review focused its hearings on two water contamination incidents in the Ohio River: spills of carbon tetrachloride, and the dumping of highly toxic hexachlorocyclopentadiene (HEXA) and octachlorocyclopentene (OCTA) in Louisville, Kentucky sewers. This resulted in the closure of a sewage treatment plant and the direct discharge into the river of contaminated raw sewage. Both incidents temporarily affected downstream communities using the Ohio River as a drinking water source. The first issue addressed was 'Episode Response and Coordination' including: (1) notification; (2) the state's role; (3) technical analysis; (4) cleanup assistance; (5) fragmentation and need for coordination; and (6) environmental law. The second issue was 'Reporting and Monitoring' including: (1) monitoring inadequacies; (2) monitoring needs; and (3) constraints. The third issue was 'Standard Setting and Strategies of Control' including: (1) constraints to standard setting; and (2) strategies for control. The fourth issue was 'Alternative Pollution Control Strategies' including: (1) regulation/economic incentives; and (2) health/environmental quality. And the last issue discussed was 'Legislative Recommendations'. Included in this document is all testimony heard by the subcommittee. (Goldberg-Florida)
W79-03237

MORSE V. OREGON DIVISION OF STATE LANDS (AGENCY OVERSTATED ITS AUTHORITY WHEN IT PERMITTED A LAND-FILL FOR A NON-WATER-RELATED ACTIVITY).

581 P. 2d 520-28 (Or. Ct. App. 1978).

Descriptors: *Oregon, *Landfills, *Administrative decisions, *Estuarine environment, Administrative agencies, Permits, Common law, Public rights, Navigable waters, Conservation, Land development, Airports.

Citizen petitioners appealed an order of the defendant, Oregon Division of State Lands (DSL). Co-defendant city had applied for a permit to fill 32 acres of the Coos Bay Estuary in order to extend an airport runway. The DSL issued the permit on the condition the city undertake another project to mitigate the resultant loss of estuarine resources. Initially, this court-sitting as a review court-vacated the permit, stating that its issuance was inconsistent with the DSL's administrative rule requiring

that landfill projects be for a water-related activity. In response, the DSL then enacted a temporary rule deleting the 'water-related activity' requirement of the initial rule, and issued a new fill permit after the defendant city renewed its permit application. Again vacating the permit, the court ruled the DSL's deleting the 'water-related activity' requirement from its original rule was inconsistent with the purpose of the applicable state statute and was outside the agency's power to enact. Aside from the statute, the court also ruled the common-law public-trust doctrine required that public use of the lands underlying navigable waters could not be substantially modified except for water-related purposes. (Horwich-Florida)
W79-03238

COOK V. RUPP (STATUTE GIVES OWNERS OF SWAMP-LAND THE RIGHT TO DRAIN AND PROTECT THEIR LAND FOR AGRICULTURAL PURPOSES).

565 S.W. 2d 833-38 (Mo. Ct. App. 1978).

Descriptors: *Missouri, *Land reclamation, *Levee districts, *Flooding, Adjacent landowners, Impaired water use, Drainage effects, Dredging, Ditches, Swamps, Agricultural watersheds.

Plaintiffs, private landowners, sought an injunction to require defendant adjacent landowner to take remedial action to prevent flooding on plaintiff's land. Plaintiff farmed some of his land, which drained over defendant's marshy land. Defendant began to dredge a lake and deposit the mud onto his land to make it suitable for farming. Plaintiff noticed an unusual amount of water accumulating on his property, and attributed this to the defendant's reclamation work. The trial court granted partial relief, and plaintiff appealed. Affirming the lower court, the appeals court ruled there was insufficient evidence to show the need for or value of the relief sought. Plaintiff had contended defendant's project was a private reclamation which violated the Halls Levee District's reclamation plan and that because defendant had not sought permission from the district's Board of Supervisors, the reclamation project merited condemnation. But the appeals court reasoned that the statute upon which plaintiff relied includes a provision for private drainage rights. The statute gives the owner of any swamp land the right to drain and protect his property for agricultural purposes—as defendant's were—whether the land be within or without any drainage or levee district. (Horwich-Florida)
W79-03239

ELLISSON V. EVANS (WATER RIGHTS ARE SUBSTANTIVE RIGHTS AND CANNOT BE ADJUDICATED IN A SUMMARY MANNER).

583 P.2d 398-402 (Mont. 1978).

Descriptors: *Dams, *Water rights, *Montana, *Adjudication procedure, Surface runoff, Appropriation, Irrigation, Flow, Erosion, Ditches, Diversion dams, Adjacent land owners.

Plaintiff-landowners brought action to force removal of a dam on neighbor's property to allow water to resume flowing to their land. Defendant had erected the dam to divert water flowing from the land of a third party. Plaintiffs wished to use the water to irrigate their land. After the District Court ruled against plaintiff and adopted defendant's proposed findings of fact and conclusions of law, the plaintiffs appealed. The Montana Supreme Court held that the trial court should have limited its inquiry to appropriateness of plaintiff's request for a temporary injunction, since its inquiry and subsequent decision went beyond those limits, its findings of fact and conclusions of law had to be vacated. The Court stated that water rights, being a substantive property right, cannot be adjudicated in a summary way. Thus the issue of plaintiff's right to the water flow from defendant's land should not have been decided during the preliminary proceedings for injunctive relief. The Court also noted that the plaintiff bore the burden of proving a valid appropriation of the water in ques-

tion. The case was remanded to the trial court for further proceedings. (Hucks-Florida)
W79-03240

STATE OF OREGON V. CORVALLIS SAND AND GRAVEL CO. (CHANGE IN LOCATION OF RIVER BED CAUSED BY FLOOD WAS AVULSIVE AND DID NOT RESULT IN CHANGE OF OWNERSHIP OF BED).

582 P. 2d 1352-64 (Ore. 1978).

Descriptors: *Ownership of beds, *Avulsion, *Channel flow, Navigable rivers, Beds, Navigable waters, Boundaries, Rivers, Alteration of flow, Legal aspects.

The state of Oregon brought ejectment action against an Oregon corporation to determine ownership of the bed of certain navigable portions of the Willamette River, which was not a interstate boundary. The trial court awarded part of the lands to the State and part to the corporation. On remand, the Supreme Court of Oregon held that the State was entitled to possession of the navigable portions of bed which had been, or might be treated as though they had been, bed of the main channel of the river since statehood. This holding was based on the common law rule that states which were admitted to the union on equal footing with original states, acquired title to beds of their navigable waters, except for portions which had passed into private ownership prior to statehood. The Court further held that where rapidly and violently an overflow channel was changed by flood into bed of river itself, the change in location of the river was avulsive and did not result in a change of ownership of bed; thus the corporate owner of land through which one channel at issue was created, owned the bed of river in that particular channel. (Hucks-Florida)
W79-03241

DEPARTMENT OF TRANSPORTATION V. PSC RESOURCES, INC. (PROPERTY OWNER'S STANDING UNDER ENVIRONMENTAL RIGHTS ACT TO ENFORCE WATER QUALITY IMPROVEMENT ACT UPHELD).

387 A. 2d 393-99, 159 N.J. Super. 154 (Super. Ct. Law Div. 1978).

Descriptors: *New Jersey, *Water quality control, *Waste dumps, *Adjudication procedure, Legislation, State jurisdiction, Water pollution, Penalties(Legal), Damages, Legal aspects, Oil wastes, Adjacent land owners.

Plaintiff property owner brought action against defendant corporation claiming that the corporation discharged petroleum products and other material onto the plaintiff's property pursuant to the operation of a waste oil reprocessing and canning facility. The plaintiff sought judgement for damages and to enforce statutory provisions against the discharge of polluting materials. The defendant counterclaimed that the plaintiff had granted leases or licenses for third parties to dump waste upon plaintiff's property...thereby causing accumulated material to be discharged upon defendant's adjacent property, to its damage. The New Jersey Superior Court held that the plaintiff had standing under the state's Environmental Rights Act to enforce the Water Quality Improvement Act, and that the Superior Court had jurisdiction over the action brought under a state statute providing that no person shall deposit or provide storage facilities for human excrement or other pollutant matter such that it gains access to a body of water. Additionally, the court found that the corporation's failure to comply with provisions of the New Jersey Tort Claims act barred its counterclaim. Motions thus disposed of, a trial would be held. (Rule-Florida)
W79-03242

TOWN OF CHINO VALLEY V. STATE LAND DEPARTMENT (1977 AMENDMENTS TO ARIZONA'S GROUNDWATER CODE FOUND CONSTITUTIONAL).

580 P.2d 704-14 (Ariz. 1978).

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Group 6E—Water Law and Institutions

Descriptors: *Arizona, *Water distribution(Applied), *Groundwater, *Water transfer, Damages, Groundwater resources, Groundwater availability, Water supply, Reasonable use, Beneficial use, Administrative agencies, Competing uses.

Plaintiff, municipal corporation located in Arizona, brought this special action against the State (Arizona) Land Department (SLD), among others, seeking to prevent enforcement of 1977 amendments to the state's Groundwater Code. The amendments set up a system by which persons—who prior to January 1, 1977 had been transferring groundwater from and within a critical groundwater area for a specific reasonable and beneficial use—could continue such actions if they secured a certificate of exemption from the SLD. If the resulting transfer of water injured another's groundwater supply, damages could be recovered but no injunction would issue. Plaintiffs sought to enjoin the SLD from issuing such a certificate to a defendant city. Plaintiffs contended that: (1) the amendments were unconstitutional in that they violated the separation of powers clause in the state constitution; (2) property was being taken without just compensation; and (3) the state legislature had improperly delegated its powers. The Arizona Supreme Court ruled against the plaintiffs, holding that the amendments' statutory limitation of remedy was within the Legislature's power to enact. Furthermore, compensation for property rights is provided for by awarding past, present and future damages. (Quarles-Florida)
W79-03243

ASSOCIATED ENTERPRISES, INC. V. TOLTEC WATERSHED IMPROVEMENT DISTRICT (EXTENSION OF RESERVOIR CONSTRUCTION PERMIT DID NOT IMPAIR VESTED WATER RIGHTS),
578 P.2d 1359-67 (Wyo. 1978).

Descriptors: *Wyoming, *Water rights, *Reservoir construction, Reservoir sites, Eminent domain, Watershed management, Administrative agencies, Permits, Landowners, Reservoirs.

Appellants, holders of vested senior water rights, appealed an order affirming the decision of the State(Wyoming) Engineer to grant respondent Toltec Watershed Improvement District a time extension to commence and construct the Toltec Reservoir and associated facilities. Appellants, the owner and lessor of the reservoir site, argued: (1) A permit extension would impair their vested senior water rights; (2) The State Engineer's order was arbitrary and capricious because there was no 'good cause' for an extension; (3) the findings of fact contained in the extension order were not supported by substantial evidence. Affirming the extension, the state supreme court denied the first contention because of the state's power of eminent domain for reservoir construction, and because there was no grant of entry onto the land. The court denied appellants' second contention because the delay in construction was due to litigation concerning the validity of the original permit. The court also found substantial evidence to support the Engineer's findings, and thus affirmed the Order. (Horwich-Florida)
W79-03244

STATE EX REL. DEPT. OF TRANSPORTATION V. TURNIDGE (STATE QUIETS TITLE TO ACCRETED LAND),
579 P.2d 284-86 (Or. Ct. App. 1978).

Descriptors: *Oregon, *Accretion(Legal aspects), *Avulsion, *River flow, Drainage patterns(Geologic), Erosion, Floods, Topographic mapping, Maps, Land forming, Rivers.

Plaintiff state of Oregon brought suit to quiet title to a tract of land bordering the Willamette River. The state's claimed the land was accreted to land owned by its predecessor in interest. Defendants, the owners of property lying directly across the river from the disputed parcel, challenged the state's claim. The primary issue was one of fact,

specifically, was the disputed parcel of land created by accretion, as claimed by the state, or by avulsion, as claimed by the defendants. Each party produced expert witnesses who testified as to their opinions relative to the movement of the river during the relevant period of time. The evidence was conflicting and contradictory in many areas. Plaintiff's expert witness relied on two official Army engineers; maps to substantiate the state's accretion claim. Defendant's expert based his opinion primarily on a 1913 topographic map to substantiate the avulsion claim. Concurring with the trial judge, the appeals court ruled that the Army engineers' maps—prepared primarily for navigational purposes—were more reliable than the topographic map, and consequently that the disputed parcel was the result of erosion-accretion as claimed by the state. (Horwich-Florida)
W79-03245

PEOPLE EX REL. KUIPER V. WINDEN (ONE WHO ACCEPTS BENEFITS FROM SALE OF WATER RIGHTS IS ESTOPPED FROM LATER CLAIMING THOSE RIGHTS),
580 P.2d 1238-42 (Colo 1978).

Descriptors: *Colorado, *Water rights, *Appropriation, *Irrigation, Tributaries, Wells, Underground streams, Water works, Water supply, River systems, Competing uses.

Defendants, three shareholders in a ditch digging company, appealed from an injunction enjoining them from irrigating certain lands with well water. The company transported water from the Arkansas River to their property for irrigation uses there. The Pueblo (Colorado) Board of Water Works bought the ditch company's water rights, and the state Water Court subsequently entered a decree permitting use changes requested by the Board and the ditch company. The decree also required that lands historically irrigated by water diverted under the initial water rights were to be permanently removed from irrigation by water drawn from the Arkansas River or its underground tributaries. Plaintiffs, the State Engineer and a division engineer, brought the injunction action when they discovered defendants were still using tributary well water for irrigation. The defendants argued they were not parties to the decree proceeding, and therefore were not restricted by its terms. Ruling against the defendants, the state supreme court adopted the trial court reasoning that even if the decree were avoid as to the defendants, one who accepts and retains the benefits of a void judgment cannot later repudiate his action and take advantage of its invalidity. (Horwich-Florida)
W79-03246

FLOODPLAIN MANAGEMENT AND PROTECTION: PROPOSED POLICIES AND PROCEDURES,

Department of Transportation, Washington, DC, Federal Register, Vol. 43, No. 121, p. 27148-27150, Thursday, June 22, 1978.

Descriptors: *Flood plains, *Wetlands, *Legal aspects, *Federal government, Water policy, Planning, Regulation, Administration, Standards.

The Department of Transportation presents for public comment its proposed policies and procedures on protection and management of floodplains. The proposal implements both Executive Order 11988, Floodplain Management, and the guidelines for implementing the Executive Order issued by the Water Resources Council on January 25, 1978. (Stihler-Mass.)
W79-03253

IMPLEMENTATION OF EXECUTIVE ORDER NOS. 11988 AND 11990, FLOODPLAIN MANAGEMENT AND PROTECTION OF WETLANDS,

Tennessee Valley Authority, Washington, DC, Federal Register, Vol. 43, No. 107, p. 24228-24229, Friday, June 2, 1978.
W79-03388

Descriptors: *Flood plains, *Wetlands, *Legal aspects, Water policy, Management, Planning, Regulation, Tennessee Valley Authority.

The Tennessee Valley Authority proposes to adopt the presented draft procedures to guide the development, coordination and review of TVA activities. These procedures are intended to implement Executive Order Nos. 11988 and 11990, Floodplain Management and Protection of Wetlands. (Stihler-Mass)
W79-03258

FLOODPLAINS AND WETLANDS EXECUTIVE ORDERS: AVAILABILITY FOR PUBLIC COMMENT ON SERVICE PROCEDURES FOR IMPLEMENTATION.

Fish and Wildlife Service, Washington, DC, Federal Register, Vol. 43, No. 107, p. 24225-24227, Friday, June 2, 1978.

Descriptors: *Flood plains, *Wetlands, *Federal government, *Legal aspects, Water policy, Planning, Administration, Protection.

The Fish and Wildlife Service is making available for public review and comment the procedures it will use to implement Executive Order 11988, Floodplain Management, and Executive Order 11990, Protection of Wetlands. After consideration of suggestions from the public and other Government agencies, the procedures will be finalized. (Stihler-Mass)
W79-03302

FLOODPLAIN MANAGEMENT.

Soil Conservation Service, Washington, DC, Federal Register, Vol. 43, No. 107, p. 24223-24224, Friday, June 2, 1978.

Descriptors: *Flood plains, *Wetlands, *Federal government, *Legal aspects, Water policy, Administration, Standards, Regulation, Planning, Management, Protection.

These proposed rule changes prescribe the policy and general guidelines for implementing the spirit and intent of Executive Order (E.O) 11988—Floodplain Management, in Federal assistance programs administered by the Soil Conservation Service. (Stihler-Mass)
W79-03352

THE LEGAL ASPECTS OF POLLUTION - THE UK PICTURE WITH E.E.C. COMPLICATIONS, British Paper and Board Industry Federation, London (England).

J. S. Evans.
In: 115th British Paper and Board Industry Federation Conference on the Use of Technology to Improve Mill Profitability, March, 1978, London, England, Paper No. 14, 6 p.

Descriptors: *Legal aspects, *Water pollution, *Pulp and paper industry, *England, Foreign countries, Water pollution sources, Legislation, Europe, Effluents, Tidal waters, Coasts, Pipelines, Discharge(Water), Pulp wastes, Persistence, Toxicity, Absorption.

Implementation of Part II of the Control of Pollution Act (1974) in late 1979 will extend current legislative control in the United Kingdom to include nearly all pulp and paper mill discharges to inland and coastal waters. The legislative controls which previously covered only non-tidal waters will be extended to cover all discharges through pipelines to tidal waters on the sea. A three-part classification scheme has been developed for effluent chemicals according to persistence, toxicity, and bioaccumulation. The United Kingdom government remains opposed to attempts by the European Economic Community to impose uniform discharge standards on all similar effluents irrespective of the geographical location of the discharger. (Swichtenberg-IPC)

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WATER RESOURCES PLANNING—Field 6

Ecologic Impact Of Water Development—Group 6G

APPLYING THE CLEAN WATER LAW TO SOUTHEAST FORESTRY,
Soil Conservation Service, Atlanta, GA.
For primary bibliographic entry see Field 5G.
W79-03431

A PRECARIOUS BALANCE UPSET,
For primary bibliographic entry see Field 2A.
W79-03432

6F. Nonstructural Alternatives

IMPACT OF HYDROLOGIC UNCERTAINTIES ON FLOOD INSURANCE,

Texas Univ. at Austin. Center for Research in Water Resources.

L. R. Beard.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol 104, No HY11, Proceedings Paper 14168, p 1473-1484, November 1978. 10 tab, 2 ref.

Descriptors: *Flood plain insurance, *Insurance, *Statistical methods, *Risks, *Flood frequency, Hydrology, Flood profiles, Mathematical studies, Damages, Flood control, *Uncertainty principle, Expected probability, Actuarial studies.

Traditional techniques of flood frequency estimation produce a bias in estimated frequencies such that, on the average in a great many applications, floods will occur far more frequently than estimated. This is particularly critical in flood insurance studies. It appears to be imperative that the principle of 'expected probability' be used in flood frequency studies in order to remove or minimize this bias, both for application in actuarial studies and for flood plain zoning. (Singh-ISWS)
W79-03053

MUNICIPAL WATER CONSERVATION ALTERNATIVES,
Pennsylvania State Univ., University Park. School of Forest Resources.
For primary bibliographic entry see Field 3D.
W79-03092

FLOODPLAIN MANAGEMENT AND WETLAND PROTECTION PROCEDURES INTERIM GUIDELINES.
Department of the Interior, Washington, DC.
For primary bibliographic entry see Field 6G.
W79-03101

WATER RESOURCES POLICIES AND AUTHORITIES: IMPLEMENTATION OF EXECUTIVE ORDER 11988 ON FLOODPLAIN MANAGEMENT.

Corps of Engineers, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03117

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, POTTER COUNTY PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W79-03158

FLOOD PLAIN INFORMATION: WHITE RIVER, SECOND BRANCH, THIRD BRANCH AND AYERS BROOK, RANDOLPH AND BETHEL, VERMONT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03159

FLOOD PLAIN INFORMATION: PASSAIC AND MOOSE RIVERS, TOWN OF ST. JOHNSBURY, VERMONT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03160

FLOOD PLAIN INFORMATION: WEST BRANCH AND FARMINGTON RIVER, CANTON, NEW HARTFORD, AND BARKHAMSTED, CT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03161

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER AND WHETSTONE BROOK, BRATTLEBORO, VT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03162

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER, DUMMERSTON, VT.

Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03163

FLOODPLAIN AND WETLANDS MANAGEMENT.

National Aeronautics and Space Administration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03179

FLOODPLAIN MANAGEMENT AND PROTECTION: PROPOSED POLICIES AND PROCEDURES,

Department of Transportation, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03253

IMPLEMENTATION OF EXECUTIVE ORDER NOS. 11988 AND 11990, FLOODPLAIN MANAGEMENT AND PROTECTION OF WETLANDS,

Tennessee Valley Authority, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03258

FLOODPLAINS AND WETLANDS EXECUTIVE ORDERS: AVAILABILITY FOR PUBLIC COMMENT ON SERVICE PROCEDURES FOR IMPLEMENTATION.

Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03302

FLOODPLAIN MANAGEMENT.

Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03352

6G. Ecologic Impact Of Water Development

EFFECTS OF MOSQUITO CONTROL DITCHING ON JUNCUS MARSHES AND UTILIZATION OF MOSQUITO CONTROL DITCHES BY ESTUARINE FISHES AND INVERTEBRATES,

North Carolina Univ. at Chapel Hill. Inst. of Marine Sciences.
For primary bibliographic entry see Field 5G.
W79-03023

FACTORS UTILIZED IN THERMAL POWER PLANT SITING: A REVIEW THROUGH THE MID-1970's,

Clemson Univ., SC. Dept. of Environmental Systems Engineering.
For primary bibliographic entry see Field 5G.
W79-03035

ENVIRONMENTAL IMPACT STATEMENT PROJECT,

Cornell Univ., Ithaca, NY. Coll. of Engineering.

N. Orloff.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 737, Price codes: A03 in paper copy, A01 in microfiche. Cornell University Center for Environmental Research, Research Technical Completion Report, December 1978. 34 p, 3 fig, 4 append. OWRT A-056-NY(6). 14-31-0001-5032, 14-34-0001-6033, 7067, 7068.

Descriptors: *Environmental impact statements, *Citizen participation, *National Environmental Policy Act, New York State Environmental Quality Review Act, Government decision-making.

Activities of the Cornell Project on Environmental Impact Statements over the period 1975-1978 are described. The purpose of the Project was two-fold: to provide assistance to small communities and citizen groups in their review of environmental impact statements; and to develop general guides for the preparation and review of statements, based on the experience gained in these reviews. The organization and administration of the Project, its policies, the specific statements analyzed, the reports and publications produced, and the formal and informal assistance provided to government officials, are described.
W79-03041

A COMPLETION REPORT ON TECHNIQUES FOR EVALUATING THE EFFECTS OF WATER RESOURCES DEVELOPMENT ON ESTUARINE ENVIRONMENTS.

Texas Water Development Board, Austin.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 647, Price codes: A11 in paper copy, A01 in microfiche. Texas Department of Water Resources, Austin, 1978. 234 p, 87 fig, 16 tab, 35 ref, 4 append. OWRT C-4137(9024)(1). 14-31-0001-9024.

Descriptors: *Water resources, *Planning, *Estuarine environment, *Environmental effects, Computer models, Systems analysis, Limnology, Oceanography, Ecosystems, Productivity, Evaluation, San Antonio River Basin(Tex), Guadalupe River Basin(Tex), San Antonio Bay(Tex), *Texas.

This research project was designed to provide a set of analytical tools for water resources planners and decision-makers to assist them in measuring and evaluating the effects of water resources development on estuarine environments. The techniques are designed to be sufficiently flexible to analyze all types of water development and management policies. This report describes: (1) the techniques developed to measure the environmental impact of water resources development on estuarine environments, and (2) the application of these techniques to a prototype Texas river basin - estuarine system to demonstrate the approach of the methodology described and its efficacy. The methodology is tested through application to the Guadalupe and San Antonio River Basins and their associated estuary, San Antonio Bay. The capability and limitations of the methodology and the direction future efforts should take are discussed.
W79-03043

UTILITY LINE SITING AND WETLAND PRESERVATION,

Wisconsin Univ. Madison. Land Resources.
For primary bibliographic entry see Field 4C.
W79-03090

FLOODPLAIN MANAGEMENT AND WETLAND PROTECTION PROCEDURES INTERIM GUIDELINES,

Department of the Interior, Washington, DC.
Federal Register, Vol. 43, No. 112, p. 25319-25321, Friday, June 9, 1978.

Descriptors: *Flood plains, *Wetlands, *Federal government, *Legal aspects, Management, Planning, Water policy, Administration, Regulation, Standards, Protection.

Field 6—WATER RESOURCES PLANNING

Group 6G—Ecologic Impact Of Water Development

This notice provides the Department of the Interior's interim guidelines for complying with Executive Order 11988 (Floodplain Management) and Executive Order 11990 (Protection of Wetlands). (Stihler-Mass)
W79-03101

ENVIRONMENTAL PREFERENCES OF SELECTED FRESHWATER BENTHIC MACROINVERTEBRATES,
Massachusetts Dept. of Environmental Quality Engineering, Westborough, Div. of Water Pollution Control.
For primary bibliographic entry see Field 5A.
W79-03128

ECOLOGY AND ENVIRONMENT IN THE UNITED ARAB EMIRATES,
Nature Conservancy, Grange-over-Sands (England), Merlewood Research Station.
For primary bibliographic entry see Field 4C.
W79-03137

THE IMPACT OF ENVIRONMENTAL LEGISLATION ON ECONOMIC DEVELOPMENT IN APPALACHIAN NEW YORK.
New York State Dept. of Environmental Conservation, Albany, Office of Program Development and Planning.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-272 698, Price codes: A08 in paper copy, A01 in microfiche. Sponsored by Appalachian Regional Commission, Washington, D.C. NY-3608-74-1-302-0520. Report ARC 74-219 3608, Jan 1977. 167 p, 30 tab, 4 append. 74-219.

Descriptors: *Resources development, *Environmental effects, *Environmental control, *Water quality management, *Air quality management, *Regional economics, *Economic impacts, *Water pollution control, *Impacts, Air pollution, Water pollution, Water pollution sources, Flood plains, Flooding, Waste disposal, Industrial wastes, Appalachian New York, Environmental protection, Waste loadings, Non-point pollution, Economic development, Industrial development, Industry, Legislation.

The purpose of this report is to provide quantitative and qualitative information on the relationship of environmental programs and economic development for Appalachian New York in order to identify points of conflict between environmental management and economic development objectives as well as complementary conditions where objectives are, or can be, mutually supportive. The main focus is on air and water pollution controls as required under the Clean Air Act Amendments of 1970 and the Federal Water Pollution Control Act Amendments of 1972. A smaller assessment was conducted on the National Flood Insurance Program, Coastal Zone Management Program, and national land use legislation. The study area includes Binghamton, Elmira-Corning, Jamestown, Norwich and Olean, NY. Summary findings and recommendations focus on impacts and conditions that deserve attention from policy-makers at Federal, state and local levels, and highlight where environmental programs have been supportive of economic development objectives and where they impinge on development. Recommendations for action, initiatives and procedures are presented. It was found that the major environmental programs assessed will have only marginal impact on economic development in the area. Costs for manufacturers to comply with existing air and water pollution control programs are listed and are not a factor in decisions on the expansion of existing operations or location of new plants. The limited overall growth envisioned for manufacturing industries is due to the unfavorable competitive forces that have affected the industrial base of most of the northeast states. Extensive tables are presented listing costs of compliance, environmental standards, industrial discharges and levels of pollutants, and location of existing industries. (Coan-N)
W79-03145

WATER AND SEWER FUNDING PROGRAMS AT FMHA, EDA, AND HUD: A SURVEY OF ENVIRONMENTAL IMPLICATIONS,
National Wildlife Federation, Washington, DC. Resources Defense Div.
For primary bibliographic entry see Field 5G.
W79-03147

ENVIRONMENTAL RESOURCES MANAGEMENT STUDIES OF THE KISSIMMEE RIVER BASIN,
Florida Univ., Gainesville, Dept. of Environmental Engineering Sciences.
For primary bibliographic entry see Field 5G.
W79-03150

FLOODPLAIN MANAGEMENT AND WETLANDS PROTECTION.
Small Business Administration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03152

PROTECTION OF WETLANDS.
Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03153

ENVIRONMENTAL POLLUTION CONTROL: TWO VIEWS FROM THE GENERAL POPULATION,
Kansas State Univ., Manhattan, Dept. of Political Science.
For primary bibliographic entry see Field 5G.
W79-03154

ENVIRONMENTAL AND ECONOMIC PROBLEMS ASSOCIATED WITH THE DEVELOPMENT OF THE BURNS WATERWAY HARBOR, INDIANA.
Comptroller General of the United States, Washington, DC.

For primary bibliographic entry see Field 5G.
W79-03157

CONSIDERATION OF FLOOD PLAINS AND WETLANDS IN DECISIONMAKING.
General Services Administration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03175

FLOODPLAIN AND WETLANDS MANAGEMENT.
National Aeronautics and Space Administration, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03179

THE COMPARATIVE STUDY OF ENVIRONMENTAL POLITICS: FROM GARBAGE TO GOLD,
Uppsala Univ. (Sweden), Dept. of Political Science.
For primary bibliographic entry see Field 6E.
W79-03189

WATER RESOURCES PROJECT TYPE ACTIVITIES: CHANNEL MODIFICATION GUIDELINES.
Fish and Wildlife Service, Washington, DC. and Soil Conservation Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03190

COST OF SOCIAL AND ENVIRONMENTAL REGULATIONS IN CONSTRUCTION,
Ohio Northern Univ., Ada.
For primary bibliographic entry see Field 5G.
W79-03191

THE DEVELOPMENT OF REGIONAL IMPACT REVIEW PROCESS AND ITS APPLICATION TO GENERAL DEVELOPMENT CORPORATION'S PORT MALABAR DEVELOPMENT IN PALM BAY AND BREVARD COUNTY, FLORIDA,
Florida Univ., Gainesville, School of Law.
For primary bibliographic entry see Field 6E.
W79-03198

FLOODPLAIN MANAGEMENT AND PROTECTION: PROPOSED POLICIES AND PROCEDURES,
Department of Transportation, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03253

IMPLEMENTATION OF EXECUTIVE ORDER NOS. 11988 AND 11990, FLOODPLAIN MANAGEMENT AND PROTECTION OF WETLANDS,
Tennessee Valley Authority, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03258

FLOODPLAINS AND WETLANDS EXECUTIVE ORDERS: AVAILABILITY FOR PUBLIC COMMENT ON SERVICE PROCEDURES FOR IMPLEMENTATION,
Fish and Wildlife Service, Washington, DC.
For primary bibliographic entry see Field 6E.
W79-03302

OCS OIL AND GAS: AN ASSESSMENT OF THE DEPARTMENT OF THE INTERIOR ENVIRONMENTAL STUDIES PROGRAM,
National Academy of Sciences-National Research Council Washington, DC. Committee on Natural Resources.
Report to the Department of the Interior, Bureau of Land Management, 1977. 119 p, 4 fig, 4 tab, 44 ref, 3 append. AA550-CT6-30.

Descriptors: *Baseline studies, *Environmental effects, *Oil pollution, *Evaluation, Water pollution effects, REsources development, Programs, *Outer Continental Shelf, Energy sources.

The study examined the concepts, procedures, and results of the Department of Interior Environmental Studies Program in order to provide an evaluation and recommendations that the Department could use as a basis for improvement of the Program. The study focused on the needs, concept, and procedures of the Program and the actual or potential use of the results. It is the Committee's finding that the Program has not been based on an adequate assessment and identification of the scientific research that is required to answer environmental concerns for oil and gas operations. (Sinha-OEIS).
W79-03376

THE SANDS OF WRATH: AMERICA'S DUST BOWL IN RETROSPECT,
Texas Tech Univ., Lubbock.
For primary bibliographic entry see Field 4C.
W79-03434

7. RESOURCES DATA

7B. Data Acquisition

TEMPERATURE MONITORING OF AN INSULATED WATERMAIN,
Ontario Ministry of the Environment, Toronto, Pollution Control Branch.
For primary bibliographic entry see Field 8G.
W79-03012

REMOTE SENSING DETECTION OF PERCHED WATER TABLES, A PILOT STUDY,
California Univ., Santa Barbara, Dept. of Geography.

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RESOURCES DATA—Field 7

Evaluation, Processing and Publication—Group 7C

For primary bibliographic entry see Field 4B.
W79-03040

MEASUREMENT OF OCEAN WAVE HEIGHTS USING THE GEOS 3 ALTIMETER,

National Oceanic and Atmospheric Administration, Boulder, CO. Wave Propagation Lab.
C. L. Rufenach, and W. R. Alpers.
Journal of Geophysical Research, Vol 83, No C10, p 5011-5018, October 20, 1978. 9 fig, 3 tab, 13 ref, 3 append. NOAA 03-022-35163, NASA 855-33-09-53.

Descriptors: *Ocean waves, *Remote sensing, *Radar, *Satellites(Artificial), Measurement, Data processing, Statistical methods, Statistics, Oceans, Storms, Oceanography, Geos 3, Altimeters, Radar altimeters, Wave height.

Radar altimeter signals transmitted from the low-orbiting satellite Geos 3 were analyzed for two selected orbits over high seas associated with hurricane 'Caroline' in the Gulf of Mexico and a North Atlantic storm. The measured values of significant wave height were in reasonable agreement with surface measurements, provided that the altimeter data were properly edited. The internal consistency of estimated wave heights for the North Atlantic storm, a standard deviation of 0.6 m or less, and the good agreement with surface truth lend credence to the method. A statistical analysis of the pulse slope variation gave estimated values of significant wave height within + or - 1 m of the true values 75% of the time for spatial averaging over 70 km. (Sims-ISWS)
W79-03076

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,

National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
P. Van Wie.

Available from the National Technical Information Service, Springfield, VA 22161 as N78-10542, Price codes: A02 in paper copy, A01 in microfiche. Presented at Director's Scientific Seminar, Earth Resources Survey: Technology Transfer and System Concept Development, February 1977. 17 p, 14 fig. NAS3-22894.

Descriptors: *Remote sensing, Hydrology, *River basins, *Hydrologic data, *Information utilization, *Landsat satellites, Watersheds, Topographic mapping, Data collection, Land classification, Maps, Climatic data, Watersheds, Water resources management, Data sources, Data management, Bear River(UT), Utah.

This report presents the text of the Atmospheric and Oceanographic Information Processing System (AOIPS) Water Resources Data Management System and its computer-generated displays used to assist hydrologists when analyzing the physical processes occurring in watersheds. The AOIPS is designed to alleviate some of the problems encountered while investigating the complex interrelationships between: Land cover type; topography; precipitation; snow melt; surface runoff; evapotranspiration; and streamflow rates. These problems result from the varying and dissimilar data types with which researchers must work. These dissimilar sources include thematic maps, aerial photography, and point-source measurements, and they differ in spatial resolution, cartographic projection, and dimensionality and format. The report lists various data types needed for hydrologic investigations but which can be accommodated by this Data Management System. The data types described are Landsat MSS imagery and digital topographic data, SMS VARR imagery and more traditional basin maps, streamflow and temperature records. Examples of accompanying Landsat images and descriptions of these images are provided. The Bear River watershed in Northern Utah, Idaho and Wyoming was selected as a case study area to demonstrate and test the system. (Coan-NC)
W79-03141

PERFORMANCE EVALUATION OF GUILDLINE MODEL 8400 LABORATORY SALINOMETER,

National Oceanographic Instrumentation Center, Washington, DC.

J. E. Boyd.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-259 696, Price Codes: A03 in paper copy, A01 in microfiche. Report No. NOAA-TM-NOS-18, July 1976. 23 p, 6 fig, 3 tab.

Descriptors: *Salinometers, *Salinity, *Laboratory equipment, Saline water, Conductivity, Water sampling, Temperature, Sea water.

Results of a laboratory evaluation of the Guildline Model 8400 Laboratory Salinometer (Autosal) is presented. The salinometer is designed to measure the conductivity ratio of sea water samples with an equivalent accuracy of plus or minus 0.003 part per thousand (ppt) salinity and employ a measurement principal entirely different from that of other available instruments. Testing was performed for overall accuracy, repeatability, and stability of the conductivity ratio measurements as well as the effects of variations in bath temperature, ambient temperature, and power supply voltage and frequency. Test results indicate that the instrument's performance exceeds the published specifications of the manufacturer and more specifically that the conductivity ratio accuracy was better than plus or minus part per million equivalent salinity. Results are presented in detail and graphs and other illustrations are included. (Gibson-IPA).
W79-03270

A HIGH-ACCURACY RECORDING PAN-EVAPORIMETER AND SOME OF ITS POSSIBILITIES,

Institute for Land and Water Management Research, Wageningen (The Netherlands).

For primary bibliographic entry see Field 2D.
W79-03281

AN AUTOMATIC SCANNING RECORDING TENSIOmeter SYSTEM,

Bristol Univ. (England). Dept. of Geography.

For primary bibliographic entry see Field 2G.
W79-03282

SOIL MOISTURE DETERMINATION USING MICROWAVE RADIATION,

Connecticut Agricultural Experiment Station, New Haven.

For primary bibliographic entry see Field 2G.
W79-03303

INFLATABLE STRADDLE PACKERS AND ASSOCIATED EQUIPMENT FOR HYDRAULIC FRACTURING AND HYDROLOGIC TESTING,

Geological Survey, Denver, CO. Water Resources Div.

E. Shuter, and R. R. Pemberton.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-288 403, Price codes: A02 in paper copy, A01 in microfiche. Water-Investigations 78-35, July 1978. 16 p, 9 fig, 4 ref.

Descriptors: *Borehole geophysics, *Aqueous, *Hydrogeology, Structural geology, *Aquifer characteristics, Fractures(Geologic), Testing, Methodology, Equipment, Logging(Recording), Planning, Injection wells, Waste disposal wells, Groundwater resources, Transmissivity, *Inflatable packers, *Multiple-aquifer wells.

Independent testing of aquifers is the only way to fully understand the hydrology encountered in boreholes intersecting multiple aquifers. The most feasible method of testing multiple-aquifer wells is through the use of inflatable packers. Straddle packers and associated equipment described are valuable tools for making tests of isolated aquifers as well as conducting hydraulic-fracturing experiments. The system permits multiple tests in a borehole without the necessity of tripping in and out of

the hole to redress the packers prior to testing each zone. Electronic pressure transducers, the output of which was fed into strip-chart recorders, were used to monitor the zone being tested, as well as to monitor the zones above and below the packers. This was necessary to ensure that no leaking had occurred around the packers, causing hydraulic continuity between the isolated zones. (Woodard-USGS)
W79-03342

RELATIONSHIP BETWEEN LEAF AREA AND DRY MATTER IN WINTER WHEAT,

Agricultural Research Service, Sidney, MT. Northern Plains Soil and Water Research Center.

J. K. Aase.

Agronomy Journal, Vol. 70, No. 4, p 563-565, July-August, 1978. 3 fig, 14 ref.

Descriptors: *Wheat, Leaves, Plant growth, Growth stages, *Montana, Dry matter.

Models of plant growth and plant water use often require leaf-area measurements, a potentially time-consuming and costly process. The objective of this study was to determine if by establishing a relationship between leaf area and dry matter in winter wheat (*Triticum aestivum* L. em Thell), that dry matter can be substituted for leaf area. Four cultivars of winter wheat were sown on Dooley sandy loam and Williams loam (fine-loamy, mixed, Typic Argiborolls) in northeastern Montana in three divergent growing seasons. Leaf area and dry matter determinations, from random 30-cm row plant samples cut at ground level, were made weekly throughout the season. Leaf area and leaf dry matter were closely correlated (coefficient of determination = 0.951). Leaf area vs. plant dry matter also was closely correlated (coefficient of determination = 0.948) through the fifth growth stage (leaf sheaths strongly erect, tillering complete). Thus it appears that in studies and modeling efforts where leaf area indices are needed, at least for winter wheat, leaf dry matter may be substituted for leaf area index. (Skogerboe-Carolado State)
W79-03427

AN ASSESSMENT OF THE PERFORMANCE OF DIFFERENT BOTTOM SAMPLERS,

Akademiya Nauk SSSR, Moscow. Inst. Biologii Vnutrennykh Vod.

For primary bibliographic entry see Field 5A.

W79-03495

7C. Evaluation, Processing and Publication

DIURNAL VARIATION IN RAINFALL AND CLOUDINESS,

Hawaii Univ., Honolulu. Water Resources Research Center.

For primary bibliographic entry see Field 2B.
W79-03033

PUBLIC GROUNDWATER SUPPLIES IN PULASKI COUNTY,

Illinois State Water Survey, Urbana.

For primary bibliographic entry see Field 4B.
W79-03045

HISTORICAL CLIMATOLOGY,

University of East Anglia, Norwich (England).

Climatic Research Unit.

For primary bibliographic entry see Field 2B.
W79-03068

TREE-RING EVIDENCE OF PAST CLIMATIC VARIABILITY,

Arizona Univ., Tucson. Lab. of Tree-Ring Research.

For primary bibliographic entry see Field 2B.
W79-03069

PREDICTABILITY OF CLIMATE,

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

National Center for Atmospheric Research, Boulder, CO.
For primary bibliographic entry see Field 2B.
W79-03074

PREDICTING TEMPERATURE TREND IN THE NORTHERN HEMISPHERE TO THE YEAR 2000,
British Meteorological Office, Bracknell (England).
For primary bibliographic entry see Field 2B.
W79-03075

ASPECTS OF PRESENT HYDROLOGICAL AND WATER QUALITY MODELLING,
Karlsruhe Univ. (Germany, F.R.) Inst. fuer Siedlungswasserwirtschaft.
For primary bibliographic entry see Field 6A.
W79-03082

PROCEEDINGS OF A WORKSHOP ON MELLING OF WATER DEMANDS.
International Inst. for Applied Systems Analysis, Laxenburg (Austria).
For primary bibliographic entry see Field 6D.
W79-03083

INTER-DISTRICT WATER ALLOCATIONS VIA LINEAR PROGRAMMING AND LINEAR PROGRAMMING DECOMPOSITION,
Iowa Univ., Iowa City, Inst. of Hydraulic Research.
For primary bibliographic entry see Field 4A.
W79-03091

A NONLINEAR PROGRAMMING ALGORITHM FOR REAL-TIME HOURLY RESERVOIR OPERATIONS,
California Univ., Los Angeles. Dept. of Engineering Systems.
For primary bibliographic entry see Field 4A.
W79-03093

A COMMUNITY SURVEYS ITS SANITATION PROBLEMS,
Bowling Green State Univ., OH. Dept. of Sociology.
For primary bibliographic entry see Field 5G.
W79-03098

ILLINOIS NATURAL HISTORY SURVEY REPORTS OF CLAMS AND DUCKS,
Illinois Natural History Survey, Urbana.
R. E. Sparks.
Report No. 164 February 1977 4 p. OWRT B-097-III (5).

Descriptors: Water quality, Clams, Benthic fauna, Benthos, Aquatic life, Aquatic populations, Waterfowl, Aquatic animals, *Ducks, *Illinois, Iowa, *Keokuk Pool(Ill-Iowa).

The Keokuk Pool is a 46-mile section of the Mississippi River backed up behind a dam which extends from Hamilton on the Illinois side to Keokuk on the Iowa side. The Pool hosts the greatest concentration of diving ducks in the Mississippi Flyway during Spring and Fall migrations and has been one of the most productive pools of the Upper Mississippi in terms of game and commercial fishes. The heavy abundance of benthic food organisms, particularly fingernail clams. Recent sampling has shown the fingernail clam populations are only 5-10% of the previous year and their size is smaller. Utilization of the Pool by ducks has declined as a result of the lower fingernail clam population. The low clam populations appear to be related to the flow of the Mississippi River, which means that there is less waste dilution. Specific factors responsible for the decline of the clam population have not been identified. Bioassays are being conducted to determine the fingernail clam's water quality requirements.
W79-03100

SYSTEMATIC PLANNING OF URBAN STORM-DRAINAGE UTILITIES,
Purdue Univ., Lafayette, IN. School of Civil Engineering.
For primary bibliographic entry see Field 6A.
W79-03109

DYNAMICS OF POLYCHLORINATED BI-PHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT, PHASE 1, TASK 1, COMPILATION OF INFORMATION,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03118

DYNAMICS OF POLYCHLORINATED BI-PHENYLS IN THE UPPER MISSISSIPPI RIVER, FINAL REPORT PHASE 1, TASK 2: EVALUATION OF COMPILED INFORMATION,
URS Co., Seattle, WA.
For primary bibliographic entry see Field 5C.
W79-03119

USERS MANUAL FOR LPTOR - A FORTRAN IV LINEAR PROGRAMMING ROUTINE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.

T. Jonch-Claussen, and J. H. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 762, Price codes: A03 in paper copy, A01 in microfiche. Interim Report, May 1976. 39 p, 3 append. OWRT B-115-COLO(2), 14-31-0001-5060.

Descriptors: *Linear programming, Water resources, *Computer programs, *Algorithms, FORTRAN language.

A documentation of the computer algorithm LPTOR for solving linear programming problems is presented. The algorithm, known as the general differential algorithm, is briefly described. A detailed input description for the computer program is given, and the use of the program is illustrated by an example. The mathematical flowchart and program listing are appended. A subroutine, GAUSS, which enables the solution of a system of linear equations, as well as the inversion of a matrix, is documented separately in an appendix.
W79-03123

AOIPS WATER RESOURCES DATA MANAGEMENT SYSTEM,
National Aeronautics and Space Administration, Greenbelt, MD. Goddard Space Flight Center.
For primary bibliographic entry see Field 7B.
W79-03141

FLOOD PLAIN INFORMATION: ALLEGHENY RIVER, POTTER COUNTY PENNSYLVANIA.
Army Engineer District, Pittsburgh, PA.
For primary bibliographic entry see Field 4A.
W79-03158

FLOOD PLAIN INFORMATION: WHITE RIVER, SECOND BRANCH, THIRD BRANCH AND AYERS BROOK, RANDOLPH AND BETHEL, VERMONT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03159

FLOOD PLAIN INFORMATION: PASSAUGIC AND MOOSE RIVERS, TOWN OF ST. JOHNSBURY, VERMONT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03160

FLOOD PLAIN INFORMATION: WEST BRANCH AND FARMINGTON RIVER, CANTON, NEW HARTFORD, AND BARKHAMSTED, CT.

Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03161

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER AND WHETSTONE BROOK, BRATTLEBORO, VT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03162

FLOOD PLAIN INFORMATION: CONNECTICUT RIVER, WEST RIVER, DUMMERSTON, VT.
Army Engineer District, Waltham, MA.
For primary bibliographic entry see Field 4A.
W79-03163

DATA-INTENSIVE SPATIAL SAMPLING AND MULTIPLE HIERARCHICAL CLUSTERING: METHODOLOGICAL APPROACHES TOWARD COST/TIME EFFICIENCY IN NATURAL RESOURCE ASSESSMENT,
Arizona Univ., Tucson. School of Renewable Natural Resources.
For primary bibliographic entry see Field 6A.
W79-03188

USER'S MANUAL FOR QPTOR - A FORTRAN IV QUADRATIC PROGRAMMING ROUTINE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering.
T. Jonch-Claussen, and H. J. Morel-Seytoux.
Available from the National Technical Information Service, Springfield, VA 22161 as PB-291 725, Price codes: A05 in paper copy, A01 in microfiche. Interim Report, March 1977. 72 p, 3 append. OWRT B-115-COLO(3), 14-31-0001-5060.

Descriptors: *Quadratic programming, Water resources, *Computer programs, Algorithms, FORTRAN language.

A documentation of the computer algorithm QPTOR for solving quadratic programming problems is presented. The algorithm, known as the general differential algorithm, is briefly described. A detailed input description for the computer program is given, and the use of the program is illustrated by an example. The mathematical flowchart and program listing are appended. A subroutine, GAUSS, which enables the solution of a system of linear equations, as well as the inversion of a matrix, is documented separately in an appendix.
W79-03271

A METHOD FOR THE ANALYSIS OF DRAWDOWN FROM MULTIPLE-SOURCE TEST PUMPING,
Southern Water Authority, Eastleigh (England). Directorate of Resource Planning.
For primary bibliographic entry see Field 4B.
W79-03283

EFFECTS OF SIZE AND SHAPE OF A REGION ON DROUGHT COVERAGE,
Colorado State Univ., Fort Collins. Dept. of Civil Engineering; and Colorado State Univ., Fort Collins. Hydrology and Water Resources Program.
For primary bibliographic entry see Field 2B.
W79-03296

EVALUATION OF THERMOGRAPH DATA FOR CALIFORNIA STREAMS,
Geological Survey, Menlo Park, CA. Water Resources Div.
For primary bibliographic entry see Field 2E.
W79-03336

PRINCIPAL USES OF FRESHWATER IN FLORIDA, 1975,
Geological Survey, Tallahassee, FL. Water Resources Div.

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RESOURCES DATA—Field 7

Evaluation, Processing and Publication—Group 7C

G. G. Phelps.

Florida Bureau of Geology, Tallahassee, Map Series No. 83, 1978. 1 sheet, 2 ref.

Descriptors: *Water utilization, *Freshwater, *Water supply, *Florida, *Maps, Water users, Municipal water, Industrial water, Irrigation water, Thermal powerplants, Domestic water, Water demand.

As a result of Florida's rapid and continuing growth in population and industry, the demand for water for municipal, industrial, and agricultural supply has increased. Information about the extent of available water resources and the present rate of consumption are needed for planning and effective management of Florida's water resources to meet water needs of the future. In 1975, the U.S. Geological Survey and State water management agencies jointly conducted a detailed inventory of water use throughout the State to provide a data base to aid in predicting future water needs. This map report portrays some of the information collected, including a generalized display of rates of water use by the counties of the State and the principal purposes for which the water is used. Total water use, in millions of gallons per day, for all uses by counties is shown. (Woodard-USGS) W79-03338

DISSOLVED-SOLIDS CONCENTRATIONS OF WATER IN THE SANDSTONE AQUIFER, WISCONSIN,
Geological Survey, Madison, WI. Water Resources Div.

R. W. Devaul.
Wisconsin Geological and Natural History Survey (Madison), 1975. 1 sheet.

Descriptors: *Wisconsin, *Dissolved solids, *Groundwater, *Maps, *Water quality, Aquifers, Water wells, *Sandstone aquifer(Wis).

A map, at a scale of 1:100,000, shows the dissolved-solids concentration of water in the sandstone aquifer, Wisconsin. Natural water quality, as indicated by the total dissolved-mineral matter in the water, is shown for the sandstone aquifer on a contour map in 100 milligram per liter intervals. Areas with values greater than 600 milligrams a liter are not contoured, but dissolved-solids concentration is shown for individual wells yielding water containing more than 1,000 milligrams per liter total solids. These values are not considered really representative and are not used in contouring. (Woodard-USGS) W79-03341

PROGRAM OBJECTIVES FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX) FOR FISCAL YEAR 1979,
Geological Survey, Reston, VA. Water Resources Div.

For primary bibliographic entry see Field 10D. W79-03348

URBAN STORM-WATER-QUALITY DATA, PORTLAND, OREGON, AND VICINITY,
Geological Survey, Portland, OR. Water Resources Div.

T. L. Miller.
Open-file report 78-851, 1978. 23 p, 1 fig, 5 tab, 3 ref.

Descriptors: *Urban runoff, *Storm runoff, *Small watersheds, *Urban hydrology, *Water quality, Surface runoff, Water analysis, Discharge(Water), Flow rates, Rainfall-runoff relationships, Data collections, Hydrologic data, *Portland(Oreg), *Vancouver(Wash).

Urban storm-water-quality characteristics in the metropolitan area of Portland, Oreg., and Vancouver, Wash., were determined for eight drainage basins with varying drainage areas, basin slopes, impervious areas, and land uses. Automatic water-quality samplers, rain gages, and stream gages were installed in each basin. Data were collected to determine rainfall intensities and define dis-

charge hydrographs. Data show variation in concentration for about 20 parameters. This report contains data collected between May 1, 1976, and June 3, 1977. (Woodard-USGS) W79-03349

DISCHARGE DATA AT WATER-QUALITY MONITORING STATIONS IN ARKANSAS, 1977 WATER YEAR,

Geological Survey, Little Rock, AR. Water Resources Div.

R. K. Knott.
Open-file report 78-824, 1978. 17 p, 2 tab.

Descriptors: *Streamflow, *Flow rates, *Discharge(Water), *Water quality, Stations, *Arkansas, Basic data collections, Water pollution control.

Discharge data were computed for a network of water-quality monitoring stations operated by the Arkansas Department of Pollution Control and Ecology. Some of the sites are located at U.S. Geological Survey or U.S. Army Corps of Engineers daily-discharge stations, but most are at points where discharges are not measured regularly. (Woodard-USGS) W79-03354

DESCRIPTION OF DATA-COLLECTION SYSTEM AND SYNOPSIS OF SELECTED HYDROLOGIC DATA FOR SOLDIER CREEK BASIN, KANSAS,

Geological Survey, Lawrence, KS. Water Resources Div.

W. J. Carswell, Jr.
Open-file report 78-678, July 1978. 80 p, 32 fig, 5 tab, 8 ref, 2 append.

Descriptors: *Hydrologic data, *Rainfall, *Surface waters, *Groundwater, *Water quality, Sediment transport, Particle size, Streamflow, Peak discharge, Observation wells, Rainfall disposition, Rainfall-runoff relationships, Data collections, *Kansas, *Soldier Creek basin(Kan).

Soldier Creek basin is a long, narrow basin encompassing an area of about 290 square miles almost directly north of Topeka, Kansas. A wide range of hydrologic data has been collected in the basin since the spring of 1964. These data include rainfall, stream discharge, sediment concentrations, chemical quality of water, and ground-water altitudes. The data collection system consists of 7 recording streamflow stations, 3 recording rainfall stations, 31 nonrecording rainfall stations, and 31 ground-water observation wells. Sediment and chemical quality of water samples were collected intermittently at selected sites. A synopsis of the time and space distribution of rainfall and peak flow are provided in graphic and tabular form for selected events of rainfall and peak flow. Representative data concerning the chemical quality of water and the fluvial sediment also are included. Selected ground-water and seepage-investigation data are depicted graphically. (Woodard-USGS) W79-03355

WATER RESOURCES DATA FOR UTAH, WATER YEAR 1977,

Geological Survey, Salt Lake City, UT. Water Resources Div.

Water-Data Report UT-77-1, September 1978. 548 p, 7 fig.

Descriptors: *Utah, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water-resources data for the 1977 water year for Utah consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 191 gaging stations, stage and contents for 12 lakes and reservoirs, water quality for 31 gaging stations, and water levels for 50 observation wells. Also included are 124 crest-stage partial-record stations and 50 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Indiana. (Woodard-USGS) W79-03358

for 44 hydrologic stations, 161 partial-record stations, and 314 wells; and water levels for 30 observation wells. Additional water data were collected at various sites not involved in the systematic data-collection program and are published as miscellaneous measurements. These data represent that part of the National Water Data System collected by the U.S. Geological Survey and cooperating State and Federal agencies in Utah. (Woodard-USGS) W79-03356

WATER RESOURCES DATA FOR ARIZONA, WATER YEAR 1977,

Geological Survey, Tucson, AZ. Water Resources Div.

Available from the National Technical Information Service, Springfield, VA 22161 as PB-287 931, Price codes: A24 in paper copy, A01 in microfiche. Geological Survey Water-Data Report AZ-77-1, September 1978. 550 p, 8 fig.

Descriptors: *Arizona, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Arizona consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels of observation wells. This report contains discharge records for 235 gaging stations, 79 crest-stage partial-record stations, and discharge measurements at 26 miscellaneous sites; stage records at 2 gaging stations; stage and contents records for 10 lakes and reservoirs; 15 supplementary records, included with gaging-station records, consisting of monthly or monthly stage, contents, and evaporation of lakes and reservoirs, diversions, and return flows; water-quality records for 67 continuous-record stations, 4 partial-record stations, and 12 miscellaneous sites; and water levels for 83 observation wells. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating Federal and State agencies in Arizona. (Woodard-USGS) W79-03357

WATER RESOURCES DATA FOR INDIANA, WATER YEAR 1977,

Geological Survey, Indianapolis, IN. Water Resources Div.

Water-Data Report IN-77-1, September 1978. 357 p, 4 fig, 2 ref.

Descriptors: *Indiana, *Hydrologic data, *Surface waters, *Groundwater, *Water quality, Gaging stations, Streamflow, Flow rates, Sediment transport, Water analysis, Water temperature, Chemical analysis, Lakes, Reservoirs, Water wells, Water levels, Data collections, Sites.

Water resources data for the 1977 water year for Indiana consist of records of stage, discharge, and water quality of streams; stage, contents, and water quality of lakes and reservoirs; and water levels in wells. This report contains discharge records for 191 gaging stations, stage and contents for 12 lakes and reservoirs, water quality for 31 gaging stations, and water levels for 50 observation wells. Also included are 124 crest-stage partial-record stations and 50 low-flow partial-record stations. Additional water data were collected at various sites, not part of the systematic data-collection program, and are published as miscellaneous measurements and analyses. These data represent that part of the National Water Data System operated by the U.S. Geological Survey and cooperating State and Federal agencies in Indiana. (Woodard-USGS) W79-03358

HYDROLOGIC AND GEOMORPHIC DATA FROM THE PICEANCE BASIN, COLORADO, 1972-77,
Geological Survey, Denver, CO. Water Resources Div.

Field 7—RESOURCES DATA

Group 7C—Evaluation, Processing and Publication

D. G. Frickel.
Open-file data report 78-825, August 1978. 169 p, 5 fig, 22 tab, 2 ref.

Descriptors: *Erosion rates, *Precipitation(Atmospheric), *Runoff, *Sediment yield, *Geomorphology, Channel morphology, Slopes, Sediment transport, Aggradation, Degradation(Stream), Hydrologic data, *Colorado, *Piceance basin(Colo), Oil-shale mining effects.

Erosion measurements made during the period 1972-77 in the Piceance basin of northwestern Colorado are presented in tabular form. Most of the measurements consist of repeated surveys of ground-surface altitudes along monumented transects at 45 hillslope sites and 121 channel sites. The sites were generally resurveyed annually and after significant hydrologic events. Also included are precipitation, runoff, and sediment-yield data for five small plots with different physical characteristics. The data were collected as part of erosion rate, sediment transport, and channel morphology studies being conducted in conjunction with development of the oil-shale resource of the area. The channel measurements were made to determine rates of aggradation, degradation, and lateral movement. The hillslope measurements were obtained to show rates of soil erosion in the area. (Woodard-USGS)
W79-03359

A CODED ALGORITHM FOR CAPACITY EXPANSION OF A WATER QUALITY MANAGEMENT SYSTEM,

Instituto Venezolano de Investigaciones Científicas, Caracas. Lab. de Ingeniería Ambiental.
For primary bibliographic entry see Field 5G.
W79-03425

8. ENGINEERING WORKS

8B. Hydraulics

HYDROLOGY OF SMALL OCEANIC ISLANDS - INFLUENCE OF ATMOSPHERIC PRESSURE ON THE WATER TABLE,

Washington State Univ., Pullman. Dept. of Geology.
For primary bibliographic entry see Field 2L.
W79-03056

WAVE DAMPENING DUE TO RUBBLE-MOUND BREAKWATERS,

British Columbia Univ., Vancouver. Dept. of Civil Engineering.

M. de St. Q. Isaacson.
Journal of the Waterways, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW4, Proceedings Paper 14178, p 391-405, November 1978. 5 fig, 14 ref, 3 append.

Descriptors: *Waves(Water), *Ocean waves, *Breakwaters, *Coastal engineering, Model studies, Mathematical models, Hydraulic models, Harbors, Structures, Coastal structures, Energy dissipation, Hydrodynamics, Engineering, Hydraulics, Wave dampening, Rubblemound breakwaters.

Laboratory experiments were performed to investigate the attenuation of waves propagating along a straight channel bounded by a pair of parallel rubblemound breakwaters. As a reasonable approximation, the spatial gradient of wave height was found to vary with the square of the height. Experimental data of the corresponding attenuation coefficient as a function of relative depth were presented for breakwater slopes of 1/1.5, 1/2, and 1/3. A simplified analysis was presented, and on the basis of this, the experimental results were reduced in order to provide a simple design procedure for the situation under consideration. (Sims-ISWS)
W79-03059

WAVE FORCES ON PIPELINE BURIED IN PERMEABLE SEABED,

New South Wales Univ., Kensington (Australia). Dept. of Theoretical and Applied Mechanics.

H. MacPherson.

Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No WW4, Proceedings Paper 14187, p 407-419, November 1978. 4 fig, 9 ref, 3 append.

Descriptors: *Waves(Water), *Pipelines, *Loads(Forces), *Mathematical models, Model studies, Theoretical analysis, Permeability, Seepage, Pore water, Pressure, Flotation, Coastal engineering, Ocean waves, *Underwater pipelines.

The wave-induced seepage force on buried pipelines was evaluated theoretically. The seepage force was shown to be large enough to warrant inclusion in future engineering design calculations for pipeline stability. The pore-water pressure field at a pipeline buried in a permeable seabed was determined from potential theory, and the pressure at the pipe was integrated to give a net seepage force. This force, of constant magnitude, rotates as the waves pass, thereby tending to force the pipe against the surrounding soil in a cyclic manner. As each wave trough passes over the pipeline, the seepage force acts vertically upwards, and when combined with the total buoyant force it increases the likelihood of pipeline flotation. (Sims-ISWS)
W79-03060

LABORATORY EXPERIMENTS WITH SOLITARY WAVE,

Techion - Israel Inst. of Tech., Haifa. Coastal and Marine Engineering Research Inst.

E. Naheer.

Journal of the Waterway, Port, Coastal and Ocean Division, American Society of Civil Engineers, Vol 104, No HY4, Proceedings Paper 14189, p 421-436, November 1978. 14 fig, 1 tab, 21 ref, 1 append.

Descriptors: *Waves(Water), *Laboratory tests, *Mathematical models, Model studies, Theoretical analysis, Ocean waves, Celerity, Roughness(Hydraulic), Velocity, Boundary layers, Oceans, Oceanography, Fluid mechanics, *Solitary waves.

Solitary waves were generated in a wave tank by a piston-type wave generator. The measured surface profile, the wave celerity, and the near-bottom fluid particle velocity under the waves were compared to those given by the approximate solutions of Boussinesq, McCowan, and Laitone.

It was found that, although Boussinesq's and McCowan's theories are of lower order of approximation than Laitone's theory, they better predict the surface profile and the fluid particle velocity of the wave. The wave celerity, on the other hand, was not presented well by McCowan's theory. It also was found that the differences between the theories increase with increasing wave height to water depth ratio. Calculations of the fluid particle velocity near the bottom showed that the three theories differ significantly when used to describe the fluid particle velocity square. It was recommended to generally use Boussinesq's theory as it represents the overall solitary wave better than the other two. (Sims-ISWS)

DIRECT SOLUTION TO PROBLEMS OF OPEN CHANNEL TRANSITIONS,

Roorkee Univ. (India). Dept. of Civil Engineering. N. Vittal.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14142, p 1485-1494, November 1978. 6 fig, 1 ref.

Descriptors: *Open channel flow, *Aqueducts, *Channels, Open channels, Hydraulics, Equations, Mathematical studies, Beds, Transition flow, *Transition zones, Open channel transitions, Aqueduct transition.

Existing methods of solving problems of open channel transitions involve trial-and-error solution of higher degree equations, and no direct solutions are available in technical literature. This paper presented unique, dimensionless, discharge-depth relationships for exponential, trapezoidal, and circular channels that facilitate direct solutions to various problems on horizontal, vertical, and combined horizontal-vertical transitions even with change in cross-sectional shape. Use of the proposed relationships was demonstrated with practical examples of culvert and aqueduct transitions. (Lee-ISWS)
W79-03286

BOUYANT SURFACE JET IN TIDAL LONG-SHORE CURRENT,

New South Wales Univ., Kensington (Australia). School of Mathematics.

E. J. Wolanski, and M. L. Banner.

Journal of the Hydraulics Division, American Society of Civil Engineers, Vol. 104, No. HY11, Proceedings Paper 14186, p. 1505-1519, November 1978. 8 fig, 1 tab, 21 ref.

Descriptors: *Model studies, *Buoyancy, *Currents(Water), Coastal engineering, Hydraulics, Hydraulic jump, Hydrodynamics, Jets, Mixing, Numerical analysis, Outfall sewers, Tides, Water pollution, *Tidal currents, Tidal longshore current.

Calculations were presented showing that a three-dimensional buoyant surface jet discharged supercritically into an infinitely large and quiescent body of receiving water transitions to subcritical flow without the occurrence of an internal hydraulic jump. A numerical model also was used to predict the bulk behavior of the jet created by the discharge of a buoyant effluent into a reversing longshore current. It was found that the plume is stretched in the offshore direction, and that the bulk Richardson number attains a local maximum along the plume center line. It was concluded that the presence of the reversing current generally will not inhibit dilution of the plume. However, under certain circumstances, the model predicted a second transition from subcritical back to supercritical flow; laboratory observations suggested that this corresponds to a splitting of the plume into two parts, one actively growing and the other floating passively in the current and later retrained into the growing plume. (Lee-ISWS)
W79-03288

ON THE NUMERICAL MODELLING OF SHORT WAVES IN SHALLOW WATER,

International Inst. for Hydraulic and Environmental Engineering, Delft (The Netherlands).

M. B. Abbott, H. M. Petersen, and O. Skovgaard. Journal of Hydraulic Research, Vol. 16, No. 3, p 173-203, 1978. 14 fig, 57 ref, 1 append.

Descriptors: *Ocean waves, *Water circulation, *Bathymetry, *Model studies, Methodology, Simulation analysis, Hydraulics, Computers, Equations, Boundary processes, Momentum equation, *Short waves, *Boussinesq equation, Breaking waves.

A modelling system was developed to generate and to run models of short waves of periodic or irregular form, with any desired physically realistic current field over any given bathymetry. The system-generated models were based upon Boussinesq equations, in which the vertical velocity is supposed to increase linearly from zero at the bed to a maximum magnitude at the surface, in two independent horizontal space variables and time. The Boussinesq equations were formulated as mass and momentum conservation laws. This formulation appeared to provide genuine weak solutions for correctly simulating breaking waves, and thus assured the correct simulation of wave thrusts, or radiation stresses, and associated longshore currents. (Singh-ISWS)
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Specialized Information Center Concrete—Group 8F

NEW NONLINEAR SHALLOW-FLOW EQUATIONS WITH CURVATURE,
National Aeronautics and Space Administration, Washington, DC.
R. F. Dressler.
Journal of Hydraulic Research, Vol. 16, No. 3, p 205-221, 1978. 5 fig.

Descriptors: *Unsteady flow, *Nonuniform flow, *Boundary processes, *Channel flow, Analytical techniques, Hydrostatic pressure, Flow separation, Hydraulics, Froude number, Mathematics, Equations, *Saint-Venant equations, Shallow-flow equations, Channel curvature, Streamlines.

New equations were derived which are a generalization of the nonlinear shallow-flow partial differential equations, usually called the Saint-Venant equations. These equations possess terms containing the curvature of channel bottom and the derivative of this curvature. Therefore, the resulting streamlines are curved, and the pressure expression contains additional terms to describe the effect of the streamline curvatures. For flat horizontal channels, the equations reduce to the Saint-Venant equations. The equations showed that the velocity is not constant over any cross section orthogonal to a curved bottom. A curve was presented showing that flow separation, defined in terms of the local Froude number, from a curved bottom will occur as a function of channel curvature. The equation can be solved easily by computer for unsteady flows. (Singh-ISWS)
W79-03293

ENERGY FLUX AND WAVE ACTION IN GRAVITY WAVES PROPAGATING ON A CURRENT,
Technical Univ. of Denmark, Lyngby. Inst. of Hydraulics and Hydraulic Engineering.
I. G. Jonsson.

Journal of Hydraulic Research, Vol. 16, No. 3, p 223-234, 1978. 5 fig, 19 ref.

Descriptors: *Waves(Water), *Hydrodynamics, *Energy equation, *Potential flow, Energy, Currents(Water), Momentum equation, Pressure, Velocity, Equations, Dynamic stresses, *Energy flux.

The total energy flux, with the mean energy level as a datum, was shown to be proportional to the wave action flux for waves on steady irrotational currents. This leads directly to the wave action conservation principle. The set-down of the mean water surface was calculated in a new and simple way. In addition, the mean Eulerian current velocity profile was discussed, and the myth of non-zero mass transport in a pure wave motion was reconsidered. Dissipative effects were neglected. (Adams-ISWS)
W79-03294

THE DAMPING OF SOLITARY WAVES,
Coastal and Marine Engineering Research Inst., Haifa (Israel).
E. Naheer.

Journal of Hydraulic Research, Vol. 16, No. 3, p 235-249, 1978. 6 fig, 1 tab, 16 ref.

Descriptors: *Waves(Water), *Boundary layers, *Fluid friction, *Energy dissipation, Fluid mechanics, Reynolds number, Dimensional analysis, Laboratory tests, Analysis, *Boundary roughness, *Wave attenuation, Solitary waves, Wave channels.

The bottom mean resistance coefficient for the flow of solitary waves was derived from considerations of energy dissipation and was obtained from measurements of the attenuation of wave amplitude along a channel. A theoretical expression for the resistance coefficient was developed for the case of laminar flow from the linearized equations of motion and was verified by experiments. Dimensional analysis was used in deriving the empirical relationships which describe the mean resistance coefficient for both laminar and rough turbulent flows. (Adams-ISWS)
W79-03295

LITTORAL DRIFT AND EROSION AT BELLE PASS, LOUISIANA,
Louisiana State Univ., Baton Rouge. Dept. of Civil Engineering.
For primary bibliographic entry see Field 2L.
W79-03299

POSITIVE FLOW ESTUARY STRUCTURE,
Poseidon Marketing and Development Co., Arcadia, CA. (Assignee).
R. W. Lundh.

U.S. Patent No. 4,114,381, 8 p, 8 fig, 4 ref. Official Gazette of the United States Patent Office, Vol 974, no 3 p 1198, September 19, 1978.

Descriptors: *Patents, *Barriers, *Estuaries, *Tides, Structures, Inflow, Gates, Saline water intrusion, Saline water barriers, Pollutants.

A barrier device comprising a number of gated structures extending between opposite shores of a tidal estuary provides a means of preventing intrusion of heavier, colder sea water with each incoming tide and to them be the means for ejecting large volumes of collected sea water together with mud, sand and sewage pollutants. The eventual effect will be to create a body of fresh water of previously unattainable purity. This purity is renewable with the discharge of any excess water available. During periods of heavy withdrawal from the upstream pool all gates can be locked closed. After danger of flooding has ended the upstream pool can then store a very large volume of fresh water. Flood water is ejected as fast as it flows into the pool. Tidal power can be used to force flood water into the sea. (Sinha - OEIS)
W79-03318

THE DEPENDENCE OF THE RESIDUAL GRAVITY ON HYDRAULIC CONSTANTS IN GLACIAL DEPOSITS,

Rhode Island Univ., Kingston. Dept. of Geology.
For primary bibliographic entry see Field 2F.
W79-03417

8C. Hydraulic Machinery

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN STUDY, VOLUME V. APPENDIX E: PROJECT DESIGNS AND COST ESTIMATES; APPENDIX F: HYDROPOWER.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03168

SITE LIMITATIONS ON SOLAR SEA POWER PLANTS,
Carnegie-Mellon Univ., Pittsburgh, PA.
C. Zener.

Journal of Hydraulics, Vol 11, No 1, p 2-3, January 1977. 1 ref.

Descriptors: *Powerplants, *Energy conversion, Resources development, Water resources, *Sites, Outer Continental Shelf, *Ocean Thermal Energy Conversion(OTEC), *Solar energy.

Successful operation of a Solar Sea Power Plant (SSPP) requires that the warm water intake draws water only from the top mixed layer of the ocean. This requirement places an upper limit Q_{max} , upon the warm water intake. In this paper, Q_{max} is calculated as a function of thickness of the upper mixed layer, the ocean current velocity, and the site latitude. Typically, this paper limit corresponds to a maximum electrical power output of some thousands of megawatts. (Sinha-OEIS)
W79-03372

SYSTEMS ASPECT OF OCEAN THERMAL ENERGY CONVERSION,
TRW Systems and Energy, Redondo Beach, CA.
R. H. Douglass, Jr. and P. J. Bakstad.
Journal of Hydraulics, Vol 12, No 1, p 18-23, January 1978. 9 fig, 5 tab, 6 ref.

Descriptors: *Powerplants, *Energy conversion, *Resources development, Water resources, *Outer Continental Shelf, *Ocean thermal energy conversion(OTEC), *Solar energy.

Solar energy conversion using an ocean-driven heat engine occupies a special place on the systems engineering horizon. In addition to the concept's proven technical feasibility, conditions in the field of OTEC research are such that systems innovations can be readily and profitably implemented. A team led by TRW Systems Group has synthesized a baseline design for an ocean thermal energy conversion (OTEC) plant of 100-MWe output, with initial cost of \$2100/KW delivered at the busbar, a cost that could be reduced considerably through the application of new technology and proposed refinements in baseline subsystems. It has been projected that a per-kilowatt cost of \$1100 for a functioning OTEC plant could be realized within the next two decades if a vigorous research and development program is carried out. (Sinha-OEIS)
W79-03375

8D. Soil Mechanics

SOIL EROSION CONTROL ON CONSTRUCTION SITES WITH PORTLAND CEMENT,
Science and Education Administration, Oxford, MS. Sedimentation Lab.

For primary bibliographic entry see Field 4D.
W79-03058

8E. Rock Mechanics and Geology

MERAMEC RIVER, MISSOURI, COMPREHENSIVE BASIN REPORT, VOLUME IV. APPENDIX C: HYDROLOGY; APPENDIX D: GEOLGY, SOILS AND MATERIALS.
Army Engineer District, St. Louis, MO.
For primary bibliographic entry see Field 6B.
W79-03167

8F. Concrete

ULTIMATE STRAIN CAPACITY TESTS, CLARENCE CANNON DAM, ST. LOUIS DISTRICT,
Army Engineer Waterways Experiment Station, Vicksburg, MS. Concrete Lab.
J. E. McDonald.

Available from the National Technical Information Service, Springfield, VA 22161 as ADA-029 816. Price codes: A04 in paper copy, A01 in microfiche. Miscellaneous Paper C-73-5, March 1973. 53 p, 18 fig, 7 tab, 5 ref, 1 append.

Descriptors: *Concrete testing, *Missouri, *Laboratory tests, *Aggregates, *Strength of materials, Dams, Structures, Hydraulic structures, Concrete, Concrete dams, Petrography, Strength, Stress, Mechanical properties, Testing, Expansion, Thermal expansion, Temperature, Engineering, Civil engineering, *Clarence Cannon Dam(Mo), *Libby Dam(Mo), *Dworshak Dam(Mo), Ultimate strain capacity.

Pertinent physical characteristics, particularly ultimate tensile strain capacity, of 1 simulated interior and 1 exterior concrete mixture containing the coarse aggregate under consideration for use in Clarence Cannon Dam were determined for input to a finite-element computer code for prediction of temperature rise in mass concrete. Results will provide a basis for the establishment of some of the temperature and construction control plans aimed toward minimizing thermal cracking. Generally, the ultimate strain capacity for Clarence Cannon Dam is related more closely to that of Libby Dam, which had a cracking problem, than to that of Dworshak Dam, which had no cracking problem. This is particularly true of the increase in strain capacity, slow versus rapid loading, where the Cannon Dam increase averaged 1.4 times as compared to increases of 1.2 and 2.1 times for Libby and Dworshak Dam, respectively. (Sims-ISWS)

Field 8—ENGINEERING WORKS

Group 8F—Concrete

W79-03046

8G. Materials

TEMPERATURE MONITORING OF AN INSULATED WATERMAIN,
Ontario Ministry of the Environment, Toronto.
Pollution Control Branch.
M. B. Fielding.
Report No RP 2044, October 1976. 20 p, 6 fig. 2 tab.

Descriptors: *Pipelines, *Monitoring, *Water temperature, *Soil temperature, *Thermal insulation, Insulation, Soil properties, Thermal properties, Water supply, Polystyrene, Frozen soils, Ontario, Canada.

The use of artificial insulation to provide frost protection for shallow-buried water mains in Ontario, Canada is discussed. A test section of pipe, insulated with an overlying slab of expanded polystyrene, was buried at a minimum depth of 3 ft. 6 in. Three temperature monitoring stations, installed in the test section, consisted of six thermistors located in and around the pipe. Two of these stations were automatically recorded; the other was a manual readout. Four other temperature monitoring stations were installed in non-insulated sections of the pipeline. Monitoring, carried out over 16 months, showed soil temperatures, the relationship of the average air temperature, soil temperature adjacent to the pipe and the temperature of the water in the pipe. It was concluded that freezing and below freezing temperatures occur in soil at depths greater than those previously recognized. Although the flat insulation installed for this study produced measurable differences compared to non-insulated sections, it did not provide significant protection of the water main against freezing. Flat slab insulation designed and installed to preclude freezing temperatures adjacent to a watermain will also retard heat gain in the soil. A reduction of residence time of the pipe contents within the pipe to less than the time to freeze will keep the pipe contents flowing. It is concluded that technology is adequate for the design of water mains to be protected against freezing. (Davison-IPA)

W79-03012

ULTIMATE STRAIN CAPACITY TESTS, CLARENCE CANNON DAM, ST. LOUIS DISTRICT,
Army Engineer Waterways Experiment Station,
Vicksburg, MS. Concrete Lab.
For primary bibliographic entry see Field 8F.

W79-03046

8I. Fisheries Engineering

ENVIRONMENTAL IMPLICATIONS IN THE DESIGN OF COOLING WATER INTAKES,
MacLaren (James F.) Ltd., Willowdale (Ontario).
D. B. Hodgins, P. E. Wisner, and F. E. J. Fry.
Canadian Water Resources Journal, Vol 3, No 3, p
33-48, 1978. 6 fig, 10 ref.

Descriptors: *Powerplants, *Cooling water, *Thermal pollution, *Intakes, Heated water, Water temperature, Thermal powerplants, Effluents, Water pollution sources, Thermal stress, Heat resistance, Engineering, Engineering structures, Nuclear powerplants, Design criteria, Intakes structures, Canada, *Thermal effluent.

One of the most important aspects of using surface waters at power plants relates to the withdrawal or intake of cooling water from the aquatic environment. This paper reviews several Canadian case studies involving environmental improvements at intakes, and outlines the stages in a general environmental approach to intake design. (EIS-Deal)

W79-03466

TWO TYPES OF FISH ATTRACTORS COMPARED IN LAKE TOHOPEKALIGA, FLORIDA,

Florida State Game and Fresh Water Fish Commission, Eustis. Eustis Fisheries Research Lab.
R. L. Wilbur.

Transactions of the American Fisheries Society, Vol. 107, No. 5, p 689-695, 1978. 6 tab, 11 ref.

Descriptors: *Fish attractants, *Creel census, *Electro-fishing, *Fish behavior, Fish management, Fish harvest, Florida, Attractants, Lakes, Fish populations, Sampling, Bass, Sunfishes, Catfishes, Sport fishing, *Brush attractor, *Block attractor, *Pipe attractor.

Two types of fish attractors, one made from vitrified clay pipes and the other from cement blocks and brush, were investigated in Lake Tohopekaliga, Florida. Electrofishing, creel census, and experimental fishing were used to evaluate the effectiveness of attractors in concentrating fish and enhancing fishing success. Both attractors produced significantly higher fishing success than did control areas and were generally superior to the average fishing success elsewhere in the lake. Brush-block attractors yielded a slightly higher success rate than the pipe attractors. Fishing success at attractor sites was highest during the first year after installation. The lower fishing success in subsequent years appeared to have been at least partially the result of a lake level drawdown which temporarily reduced the standing crop of fish and stimulated expansion of the littoral zone into deeper areas which had been devoid of plants. Soybean meal was found to be a supplemental fish attractant which increased fishing success at attractor sites where catch rates had diminished. (EIS-Deal)

W79-03469

OXYGEN CONSUMPTION OF COHO SALMON IN A PUMPED SALTWATER RACEWAY,
Weyerhaeuser Co., Seattle, WA.

G. Ferguson and B. Allie.
In: 26th Annual Northwest Fish Culture Conference, Dec 3-5, 1975, Otter Rock, Oregon, p 135-140. 2 tab, 7 ref.

Descriptors: *Aquaculture, On-site-investigations, Oxygen, *Oxygen demand, *Oxygen requirements, *Coho salmon, Saltwater, *Fish diets, Fish establishment, Fish farming, Fish hatcheries, Fish physiology, Fish stocking, Oxygen consumption.

Oxygen required for salmon production units must be derived from the air. An experiment was conducted to measure the change in oxygen content as water passes through a pumped saltwater raceway that contained coho salmon. It was observed that oxygen consumption rates are generally higher than those rates presented in the literature. (EIS-Katz)

W79-03473

9. MANPOWER, GRANTS AND FACILITIES

9A. Education (Extramural)

WATER RESOURCES SEMINAR SERIES NO. 11, (HAWAII), PAPERS PRESENTED JANUARY 1978 TO JUNE 1978.

Hawaii Univ., Honolulu. Water Resources Research Center. June 1978. 25 p.

Descriptors: *Organic compounds, *Water reuse, *Gas chromatography, Soil removal, *Flood insurance, Flood control, Manning's equation, Flash floods, Streamflow, Synoptic analysis, *Hawaii, XAD-2 resin, *Mass spectrometry, Lahaina soil, Milliani Sewage Treatment Plant, *Flood Insurance Act, Log Pearson Type III, Bernoulli's theory, Synchronous Meteorological Satellite imagery, Telemetered rain gages.

The Spring 1978 Seminar Series include three papers that present material on (1) the identification of organic compounds in treated effluent for

irrigation and the determination of whether such compounds are removed from percolating water by the soil (Green, pp. 1-4); (2) the National Flood Insurance Program, the methods and procedures used to prepare the 100-year flood insurance inundation maps of Hawaii, and the status of the flood maps (Jay, pp. 5-11); and (3) the factors contributing to Hawaiian flash floods, e.g., topography, steep watersheds with narrow basins and low capacities, sufficiently varied synoptic patterns that can cause floods in any month, stream response, and a detection system that depends primarily upon telemetered rain gages and which has no National Weather Service weather radar in Hawaii (Schroeder, pp. 13-25).

W79-03126

WATER RESOURCES SEMINAR SERIES NO. 10 (HAWAII), PAPERS PRESENTED SEPTEMBER 1977 TO DECEMBER 1977.

Hawaii Univ., Honolulu. Water Resources Research Center. December 1977. 30 p.

Descriptors: Dams, Cofferdams, Water supply, *Rhyolite aggregate, Wind waves, Lake shore erosion, Wind speed, *Riprap particles, Solar radiation, Radiation measurement, *Network sensors, *Hawaii, Aquatic algae, Oysters, Commercial shellfish, Water pollution, Dolosse, High Island, Hong Kong, Carlyle Lake, Rayleigh distribution, Eppley pyranometers, Eppley radiometer, Aquaculture, Biosynthesis, Kaneohe Bay, Kahuku, Ultraviolet filtration.

The Fall 1977 Seminar Series No. 10 includes four papers that cover a range of topics from dams constructed in the sea to exploit the last remaining major catchment in the Kai Kung Peninsula and to provide a freshwater reservoir to serve the Hong Kong area (Watson, pp. 1-8); to a practical design criterion proposed to stabilize lake shores against wind waves and the development of a methodology for estimating the height of wind waves in any lake for a given wind condition (Bhowmik, pp. 9-12); to the augmentation of a network of sunlight observations, begun in the 1930s, with the installation of Eppley pyranometers at 14 new sites on Oahu in 1976 as well as the measurement of diffuse and global radiation at the University of Hawaii Manoa campus, the primary observation site (Ekern, pp. 13-21); and to the establishment, maintenance, and development of a shelfish aquacultural system in Hawaii (Wiebanga, pp. 23-30).

W79-03127

10. SCIENTIFIC AND TECHNICAL INFORMATION

10C. Secondary Publication And Distribution

BIBLIOGRAPHY OF THE GEOLOGY AND HYDROLOGY OF THE ALBUQUERQUE GREATER URBAN AREA, BERNALILLO AND PARTS OF SANDOVAL, SANTA FE, SOCORRO, TORRANCE, AND VALENCIA COUNTIES, NEW MEXICO,
Geological Survey, Albuquerque, NM. Water Resources Div.

A. F. Wright.
Available from Supt. of Documents, GPO, Washington, DC 20402, Price, \$1.50. Geological Survey Bulletin 1458, 1978. 31 p, 2 fig, 600 ref.

Descriptors: *Bibliographies, Hydrology, Geology, *Land use, Publications, Urbanization, Water resources, Water utilization, Water quality, *New Mexico, *Albuquerque Greater Urban Area (N Mex), Cities.

This bibliography contains more than 500 references pertaining to geology and hydrology in the Albuquerque Greater Urban Area, N. Mex. Selected citations on land use and related topics also are presented. The area considered extends from Cochiti Dam to Bernardo along the Rio Grande. Each bibliographic reference is listed alphabetical-

ly under the first word of the title, the year of publication, and the name of the author.

THE NEED AND USE OF RESOURCES ON COASTAL SHORES,
Du Pont, Savannah, GA.

E. I. DuPont de Nemours & Company, Department of Energy, W. D. Williams.

Descriptives: *Coastal, Fish, Fishery, Continental Shelf.

The National Research Council has been assigned the same organization as the previous year. The primary publications on coastal resources are arranged in the following order: Descriptions, Collection, Bibliography, and Special Publications. The following subjects are included: Fisheries, Marine Biology, Oceanography, and Water Resources.

THE NEED AND USE OF RESOURCES ON COASTAL SHORES,
Du Pont, Savannah, GA.

H. W. D. Williams, E. I. DuPont de Nemours & Company, Department of Energy, W. D. Williams.

Descriptives: *Coastal, Water, Oceanography, and Special Publications.

The National Research Council has been assigned the same organization as the previous year. The primary publications on coastal resources are arranged in the following order: Descriptions, Collection, Bibliography, and Special Publications. The following subjects are included: Fisheries, Marine Biology, Oceanography, and Water Resources.

10D. Secondary Publication And Distribution

PROGRAM FOR FISHERIES FOR FISHERIES

Geological Survey, Washington, DC.

SUBJECT | SCIENTIFIC AND TECHNICAL INFORMATION—Field 10**Specialized Information Center Services—Group 10D****ACTIVATED CARBON**

M. D. Edwards. *Activated Carbon Treatment Systems*. Open-file report 78-975, 1978. 7 p.

Descriptors: *Information exchange, *Programs, *Planning, *Scheduling, *Management, Training, Data storage and retrieval, *National Water Data Exchange(NAWDEX), Water data sources.

This report describes the program objectives of the National Water Data Exchange (NAWDEX) for Fiscal Year 1979. These objectives include NAWDEX membership, program administration, management, and coordination, NAWDEX services, identification of sources of water data, indexing of water data, programs and systems documentation, recommended methods for the handling and exchange of water data, training, and technical assistance to NAWDEX members. (Woodard-USGS)
W79-03348

Descriptors: *North Carolina, *Bibliographies, *Coastal zone, Estuaries, Biology, Engineering, Fish, Fisheries, Geology, Geophysics, *Outer Continental Shelf.

ly under the author's last name or the last name of the first author. Each reference includes the title of the article or monograph, the publication source, year of publication, and page numbers, as well as illustrations labeled as figures, where applicable. (Woodard-USGS)
W79-03339

THE NORTH CAROLINA COASTAL ZONE AND ITS ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES, AND OFF-SHORE WATERS, VOLUME I,

Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab.
E. I. Du Pont de Nemours and Company Savannah River Laboratory Report to U.S. Department of Energy, No. DP-1423, November 1977. 203 p. H. W. Dubach, (Compiler). DOE-AT(07-2).1.

Descriptors: *North Carolina, *Bibliographies, *Coastal zone, Estuaries, Biology, Engineering, Fish, Fisheries, Geology, Geophysics, *Outer Continental Shelf.

The North Carolina coastal zone bibliography has been assembled in the same format and follows the same organizational arrangement as the bibliographies on South Carolina and Georgia. References are arranged in ten subject categories according to the primary information content of each item. Descriptors which may be used in automating the collection are supplied for each title. The bibliography includes references of scientific and technical literature dealing with the land area of North Carolina between the Piedmont and the shoreline and with the offshore water to the continental slope. Volume 1 contains references to the following subject areas: Biology, Engineering, Fish and Fisheries, and Geology and Geophysics. (See also W79-03381). (Sinha-OEIS).
W79-03380

THE NORTH CAROLINA COASTAL ZONE AND ITS ENVIRONMENT. A COMPILATION OF RESOURCE MATERIALS COVERING THE COASTAL PLAIN, ESTUARIES, AND OFF-SHORE WATERS. VOLUME II,

Du Pont de Nemours (E. I.) and Co., Aiken, SC. Savannah River Lab. H. W. Dubach.

E.I. Du Pont de Nemours and Company Savannah River Laboratory Report to U.S. Department of Energy, No. DP-1423, November 1977. 203 p. chiefly ref. DOE-AT(07-2).

Descriptors: *North Carolina, *Bibliographies, *Coastal zone, Estuaries, Hydrology, Groundwater, Oceanography, Climatology, *Outer Continental Shelf.

The North Carolina coastal zone bibliography has been assembled in the same format and follows the same organizational arrangement as the bibliographies on South Carolina and Georgia. References are arranged in ten subject categories according to the primary information content of each item. Descriptors which may be used in automating the collection are supplied for each title. The bibliography includes references of scientific and technical literature dealing with the land area of North Carolina between the Piedmont and the shoreline and with the offshore water to the continental slope. Volume 2 contains references to the following subject areas: Hydrology and Groundwater, Oceanography; Weather and climate; Miscellaneous references and references to charts, maps, and atlases. (See also W79-03380). (Sinha-OEIS)
W79-03381

10D. Specialized Information Center Services**PROGRAM OBJECTIVES FOR THE NATIONAL WATER DATA EXCHANGE (NAWDEX) FOR FISCAL YEAR 1979,**

Geological Survey, Reston, VA. Water Resources Div.

Hydrologic Analysis Applied to Agricultural Water Demand, W79-03307

AGRICULTURAL CHEMICALS

Standard Treated Activated Carbon as an Agricultural Chemical Control, W79-03302

AGRICULTURAL WILDFIRES

Development of Criteria for Quality Assessment of Agricultural Runoff and Irrigation Return Flow, W79-03306

The Possible Origin of Surface Water Contamination in Agricultural Fields, W79-03305

Surface Runoff from Pastured and Unpastured Fields in Major Creeks, W79-03300

AGRICULTURE

Mineral Water, Mineral Concentrations, Water Supply, Volume II, Appendix A, The Economics and Chemistry of the Resources, W79-03309

Agricultural Water Quality Audit, W79-03301

Wind and Wave Driven Annual-Volume Fluxes for Freshwater Condition, W79-03307

Properties and Behavior of Fresh Water Ecosystems, W79-03308

Treatment Techniques, Control and Treatment Costs in U.S. Agriculture, W79-03314

AIR POLLUTION

Evaluation of Pollution Control by Fixed Plant Continuous Process Operation, Series 2, 30 Gas Emissions, W79-03306

Precipitation, Temperature Trends in the Northern Hemisphere, 1900-1970, W79-03303

Regional Management Studies for the Missouri River Power Project, W79-03305

Evaluation of Sources of Urban Pollution in the Area of Kansas City, Missouri, W79-03302

AIR POLLUTION CONTROL

Technological Protection in Control of Acid Rain, W79-03308

AIR POLLUTION EFFECTS

Control of Selected Air Pollutants from Industrial Plants in Domestic Residential Regions, W79-03301

AIR QUALITY

Atmospheric Monitoring Techniques for the Mississippi River Basin, W79-03306

AIR QUALITY MONITORING

The Impact of Atmospheric Legislated Air Pollution Control Programs, W79-03305

ATMOSPHERE

Atmospheric Pollution in Coal Country, W79-03307

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ACID MINE WATER	Microbial Sulfur Cycle Activity at a Western Coal Strip Mine, W79-03308	5B
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